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PHYCOLOGIA BRITANNICA:

OR

A HISTORY OF BRITISH SEA-WEEDS,

CONTAINING

COLOURED FIGURES, GENERIC AND SPECIFIC CHARACTERS,
SYNONYMES, AND DESCRIPTIONS

OF

ALL THE SPECIES OF ALGÆ INHABITING THE SHORES OF THE

BRITISH ISLANDS.

BY

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Keeper of the Herbarium of the University of Dublin, and
Professor of Botany to the Royal Dublin Society.

IN FOUR VOLUMES.

VOL. IV.

CHLOROSPERMÆ, OR GREEN SEA-WEEDS.

SYNOPSIS, No. 280 to 388.

LONDON :

REEVE AND BENHAM,
HENRIETTA STREET, COVENT GARDEN.

1846-51.

CHLOROSPERMÆ,

OR

GREEN SEA-WEEDS.

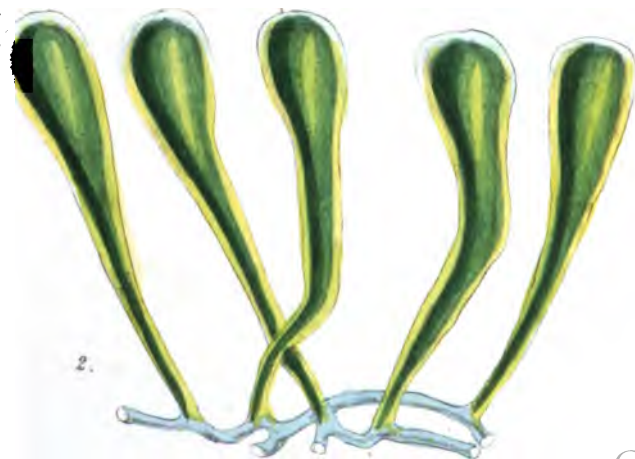


PLATE CCXC.

CODIUM BURSA, *Ag.*

GEN. CHAR. *Fronde* green, sponge-like (globular, cylindrical, or flat; simple or branched), composed of tubular, interwoven, inarticulate filaments (elongated, branching cells). *Fructification*, opaque vesicles (*conio-cystæ*) attached to the filaments. CODIUM (*Stack.*),—from κωδιον, the skin of an animal.

CODIUM *Bursa*; frond spherical, hollow.

CODIUM *Bursa*, *Ag. Sp. Alg.* vol. i. p. 457. *Ag. Syst.* p. 178. *Greav. Alg. Brit.* p. 186. *Hook. Br. Fl.* vol. ii. p. 318. *Harv. in Mack. Fl. Hib.* part 3. p. 233. *Harv. Man.* ed. 2. p. 193. *Endl. 3rd Suppl.* p. 21. *Kütz. Phyc. Gen.* p. 309. *Kütz. Sp. Alg.* p. 502.

SPONGODIUM *Bursa*, *Lamour. Ess.* p. 73.

LAMARCKIA *Bursa*, *Olivi, Zool. Adriat.* p. 258.

AGARDHIA *Bursa*, *Cabrera*, fide *Ag.*

FUCUS *Bursa*, *Turn. Hist.* t. 136. *E. Bot.* t. 2183.

ALCYONIUM *Bursa*, *Linn. Syst. Nat.* p. 1295.

BURSA marina, *C. Bauhin, Pin.* p. 368. *Ray, Syn.* p. 31. no. 3.

HAB. On submarine rocks. Perennial. Summer. Very rare.—“Coast of Sussex, plentifully,” *Pallas* (quoted by *Turner*). Shores of Cornwall, *Mr. Raskleigh*. Near Torquay, *Mrs. Griffiths*. Near Belfast, *Mr. Templeton*.

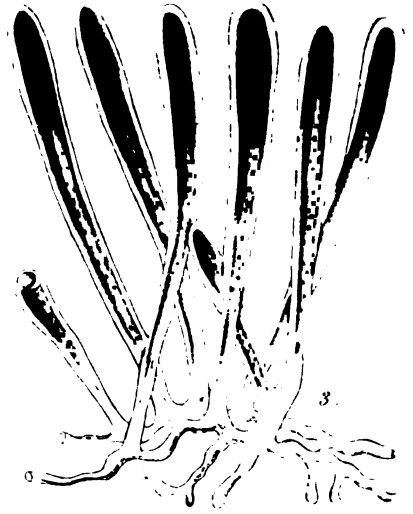
GEOG. DISTR. Atlantic shores of France and Spain. Mediterranean and Adriatic Seas.

DESCR. *Fronde* attached to the rock by interwoven and matted fibres, several fronds growing together, spherical, hollow, varying in diameter from one to six or eight inches, soft and sponge-like, entirely composed of slender fibres closely interwoven together; those which form the groundwork of the frond matted round the inner surface of the hollow ball, and throwing out to the circumference minute club-shaped, vertical ramuli, which are closely packed together, and extend with their points erect, and sides parallel, like the threads in a pile of velvet. *Substance* soft. *Colour*, when growing, a dark, full green, becoming much paler when dry. *Fructification* not observed, but probably similar to that of *C. tomentosum*.

Not being so fortunate as to possess a British specimen of this very rare and curious plant, I have been forced to make the drawing for the plate from some of a fine series which I owe

to the kindness of M. Lenormand, who procured them at Granville, on the French coast, where *Codium Bursa* is common. The station on the Sussex coast, quoted from Pallas, is not prolific in modern times, nor have I ever seen any British specimen except a small one obtained by Mrs. Griffiths, in Devonshire. No one has met with this plant near Belfast but Mr. Templeton, and I have not seen his specimens.

Fig. 1. CODIUM BURSA, fronds :—*the natural size*. 2. Filaments of which the frond is composed :—*highly magnified*.



A.



5

B.



6

PLATE XXXV. (A).

CODIUM ADHÆRENS, *Ag.*

GEN. CHAR. *Fronde* green, sponge-like, (globular, cylindrical, or flat; simple or branched), composed of tubular, interwoven, inarticulate filaments. *Fructification*; opaque vesicles attached to the filaments. CODIUM (*Stackh.*)—from κώδιον, the skin of an animal.

CODIUM *adhærens*; frond forming a velvety crust on the surface of rocks.

CODIUM *adhærens*, *Ag. Sp. Alg.* vol. i. p. 467. *Ag. Syst.* p. 178. *Harv. in Hook. Journ.* vol. i. p. 305. *Wyatt. Alg. Danm.* no. 127. *Harv. Man.* p. 145. *J. Ag. Medit.* p. 22. *Endl. 3rd Suppl.* p. 21. *Kütz. Phyc. Gen.* p. 309. *Mont. Pl. Cell. Canar.* p. 183.

AGARDHIA *adhærens*, *Cabrera, sec. Ag.*

HAB. On marine rocks, near low-water mark. Perennial. Summer and winter. Rare. At Torquay, *Mrs. Griffiths*. Sermen Cove, Land's End, *Mr. Ralfs*. At the back of the pier on a vertical rock, at Gorran Haven; and near the Bosand, Gerrans Bay, Cornwall, *Mr. Peach*. Falmouth Harbour, *Miss Warren*.

GEOG. DISTR. Atlantic coasts of Europe, from the south of England to Spain. Mediterranean Sea. Mauritius? Canary Islands, *Webb*.

DESCR. *Fronde* spreading over the surface of the rock in broad, indeterminate patches, of one, two or more feet in diameter, resembling "fragments of beautiful green velvet", composed of an under layer of entangled and interwoven, cylindrical filaments producing on the upper surface lineari-clavate, vertical branches, of equal length, parallelly arranged into the even velvety surface of the frond, and being, as it were, the *pile* of the velvet. *Substance* soft and gelatinous, closely adhering to paper. *Colour* a brilliant green, when wet.

I am indebted to Mr. Peach of Fowey for living specimens of this curious plant, which he finds in great perfection at Gorran Haven. It appears to be of slow growth; for Mr. Ralfs informs me, that patches cut out one year, are but partially filled up after twelve months. I am not quite certain that the Mauritius specimens, formerly described by me, are identical with the European.

A. Fig. 1. CODIUM ADHÆRENS:—*natural size*. 2. A portion:—*magnified*. 3. Filaments:—*more highly magnified*.

PLATE XXXV. (B).

CODIUM AMPHIBIUM, *Moore.*

CODIUM *amphibium*; fronds minute, erect, cylindrical, simple, obtuse, aggregated in widely spreading strata.

CODIUM *amphibium*, *Moore et Harv. in Ann. Nat. Hist.* vol. xiii. (1844) p. 321. pl. 6.

HAB. On turf-banks at extreme high-water mark, near Roundstone, Galway, *Mr. Mc' Calla.*

GEOGR. DISTR. West of Ireland.

DESCR. *Stratum* indefinite, composed of entangled filaments, spreading over the surface of the bog. *Fronde*s rising above the stratum, like papillæ, cylindrical or clavate, from a line to nearly half an inch in height, and from a quarter-line to more than a line in diameter, erect, distinct from each other (not massed together), obtuse, simple; their *axis* composed of branched, interwoven, irregular fibres, which throw off to the circumference club-shaped ramuli, of the same nature, and nearly the same form, as those of *C. tomentosum*. Colour a brilliant green. Substance soft.

Codium amphibium was discovered by Mr. Mc' Calla in October, 1843, spreading in patches of great extent along the edge of the sea, over the surface of a turf-bog which meets the shore at Roundstone Bay. In this situation the plant is exposed alternately to the influence of salt and of fresh water, and, it would appear, is even affected by atmospheric changes: for, its discoverer has observed, that "in dry weather it loses all its characters, the frond shrinking to a mere nothing, but on the return of moisture it immediately gets fresh again". Specimens will, I understand, be published in the second volume of M'Calla's '*Algæ Hibernicæ*'.

B. Fig. 1. CODIUM AMPHIBIUM:—*natural size.* 2. Two of the fronds:—*magnified.* 3. Filaments from the same:—*more highly magnified.*



PLATE XCIII.

CODIUM TOMENTOSUM, *Stack.*

GEN. CHAR. *Fronde* green, sponge-like (globular, cylindrical or flat; simple or branched), composed of tubular, interwoven, inarticulate filaments (elongated, branching cells). *Fructification*; opaque vesicles (*coniocystæ*) attached to the filaments. CODIUM (*Stack.*),—from κώδιον, the skin of an animal.

CODIUM *tomentosum*; frond linear, dichotomous, cylindrical or compressed.

CODIUM *tomentosum*, *Stack. Ag. Sp. Alg.* vol. i. p. 452, *Ag. Syst.* p. 177. *Spreng. Syst. Veg.* vol. iv. p. 365. *Greav. Alg. Brit.* p. 185. t. 19. *Hook. Brit. Fl.* vol. ii. p. 318. *Harv. in Mack. Fl. Hib.* part 3. p. 232. *Harv. Man.* p. 145. *Wyatt, Alg. Danm.* no. 35. *J. Ag. Alg. Medit.* p. 23. *Endl. 3rd Suppl.* p. 21. *Kütz. Phyc. Gen.* p. 309. t. 42. f. 1. *Montg. Canar. Crypt.* p. 182. *Pol. Leed.* p. 35, *Alger.* p. 48.

CODIUM *elongatum*, *Ag. Sp. Alg.* vol. i. p. 454. *Ag. Syst.* p. 177. *Endl. 3rd Suppl.* p. 21. *Montg. Alger.* p. 50. t. 13. f. 1.

CODIUM *lineare*? *Ag. l. c.*

CODIUM *filiforme*? *Montg. Alger.* p. 50. t. 10. f. 2.

SPONGODIUM *tomentosum*, *Lamour. Ess.* p. 73.

SPONGODIUM *commune*, *Bory, Dup. Voy. Bot.* p. 210.

FUCUS *tomentosus*, *Huds. Fl. Ang.* p. 514. *Stack. Ner. Brit.* t. 7. *Good. and Woodw. in Linn. Trans.* vol. iii. p. 195. *E. Bot.* t. 712. *Eesper, Fuc.* t. 112. *Turn. Syn.* vol. ii. p. 300. *Hist.* t. 135.

AGARDHIA *dichotoma*, *areolata*, et *ramentacea*, *Cabrera, in Phys. Sällsk. Arber.*

HAB. On rocks in the sea, within the range of the tide; generally near low-water mark. Perennial. Summer. Common on the rocky shores of the British Islands.

GEOG. DISTR. Common on all the shores of Europe, both Mediterranean and Atlantic. Dispersed also throughout the temperate and torrid portions of the Atlantic, Pacific, and Indian Oceans. New Holland and Tasmania. Auckland Islands.

DESCR. *Fronde* rising from an expanded velvety incrustation, which forms wide patches on the surface of rocks, solitary, or gregarious, from six inches to two feet in length, from two to four lines in diameter at the base, erect, more or less regularly dichotomous, with or without lateral ramuli. *Branches* cylindrical or frequently compressed, linear, obtuse, often expanded, sometimes greatly so, beneath the forkings. *Axis* rounded. The whole frond is coated with delicate, hyaline, horizontal filaments, one or two lines in length, and of a very soft and gelatinous substance. *Structure*; the axis is composed of innumerable, interwoven, irregularly branched, slender filaments, from which issue radiating, horizontal, somewhat clavate ramuli, whose apices constitute the surface of the frond. To the sides of these ramuli are attached the ovato-lanceolate sessile *coniocystæ*, which contain

at maturity, an oval, transversely striate, dark green mass, which is eventually discharged through a terminal pore.

At plate XXXV, I figured two of the more minute species of *Codium*;* I here present one which is of larger size, more generally known, and the most widely dispersed of the genus. It occurs throughout the Pacific Ocean from the shores of Arctic America and Asia, to the southern extremity of America; and is equally dispersed throughout the Atlantic. In general features, specimens from most countries agree, but there are slight points of difference, on which authors have founded species, which I cannot but regard as mere varieties of a common type. Such is the *C. elongatum* of Agardh, an admirable figure of which is given in the splendid 'History of Algiers,' now publishing under the auspices of the French Government. This form, which accompanies the common *C. tomentosum* on the West coast of Ireland, is chiefly remarkable for a great dilatation of the frond immediately under the forking of the branches. This enlargement certainly gives the specimens a distinct look, but traces of it may be found in various degrees of development, inseparably connecting the most dissimilar looking individuals of *C. elongatum*, with the common dichotomous, filiform *C. tomentosum*. Were *C. elongatum* admitted as a species, several other forms might be enobled on grounds as valid. There is, for instance, a common state of this plant, which is very irregularly divided, having the branches set with numerous lateral branchlets half an inch to an inch long, which is as abnormal as *C. elongatum*.

Codium tomentosum has to the naked eye quite the appearance, though not the substance or structure, of a sponge; and, indeed very closely resembles in form and colour the *Spongia hispida*, Mont., offering a beautiful instance of *analogy* between organisms whose *affinity* is widely separated.

* To the habitats given under Pl. XXXV. for *C. adhaerens* add Rathlin Island, Antrim, Mr. D. Moore, and Tory Island, Mr. G. Hyndman. Mr. Moore's specimens were gathered in 1834, and to him, therefore, the credit of being the discoverer of this plant in Ireland belongs.

Fig. 1. CODIUM TOMENTOSUM:—of the natural size. 2. Filaments of the periphery, with fruit:—highly magnified.



PLATE III.

BRYOPSIS PLUMOSA, Ag.

GEN. CHAR. *Frond* membranaceous, filiform, tubular, cylindrical, glistening, branched; the branches imbricated or distichous and pinnated, filled with a fine green, minutely granuliferous fluid. *Grev.*

BRYOPSIS *plumosa*; *frond* having a triangular outline, naked below, branched above, branches spreading, their upper half pectinato-pinnated, pinnales subdistichous.

BRYOPSIS *plumosa*, *Ag. Sp. Alg.* vol. i. p. 448. *Syst.* p. 178. *Grev. Fl. Edin.* p. 307. *Alg. Brit.* p. 187. t. 19. *Hook. Br. Fl.* vol. ii. p. 318. *Harv. Man.* p. 146. *Wyatt. Alg. Danm.* no. 128. *J. Ag. Alg. Medit.* p. 21. *Endl. 3rd Suppl.* p. 20. *Mart. Fl. Braz.* vol. i. p. 11. *Kütz. Ph. Gen.* p. 306.

BRYOPSIS *Lyngbyæi*, *Fl. Dan.* t. 1063. *Lyngb. Hyd. Dan.* p. 75. t. 19. *Spreng. Syst. Veg.* vol. iv. p. 365.

ULVA *plumosa*, *Huds. Fl. Ang.* p. 571. *Eng. Bot.* t. 2375.

HAB. In the sea, on rocks and small stones. Annual. Summer and Autumn. Frequent on the shores of the British Islands.

GEOG. DISTR. Along the Atlantic shores of Europe from the Færoe Islands to Spain. Mediterranean Sea, *J. Agardh.* South Brazil, *Martius.* Falkland Islands, *Dr. Hooker.* Cape of Good Hope, *W. H. H.*

DESC. *Root* composed of irregular entangled filaments. *Fronde* several from the same base, at first perfectly simple, straight and thread-like till they become half an inch to an inch in length, at which period they commence to form lateral branchlets in the upper half. In this state the whole plant resembles a little feather. Afterwards the naked part of the stem lengthens, and its ramuli grow out into branches 1-3 inches long and about half a line in diameter, producing, by a repetition of the primary mode of growth, several series of lesser branches, until a much branched frond results. Then, owing to the lower branches being long, and the upper gradually diminishing to the summit, the general outline is triangular or pyramidal. In every stage, however, the branches, naked below and feathered above, afford a sufficiently distinguishing character. The substance is exceedingly glossy, flaccid, and easily injured, and the colour a rich deep green. Each branch consists of a single cellule, and on wounding the outer membrane discharges its contents in the form of a granular thick fluid. In drying it adheres most closely to paper, and has a varnished appearance.

A very widely distributed plant found plentifully throughout both the temperate zones, and even in some of the warmer seas. It is perhaps also a native of the tropics, the West Indian *B. pen-*

nata of Lamouroux, being possibly a synonyme. Be this as it may, species of *Bryopsis* have been found in all parts of the world, and they resemble each other so closely, that except in a few instances it is very difficult at all times to determine to what particular *book species* individuals should be referred.

Though having all the softness of texture and brilliant green colouring of the *Confervæ*, the *Bryopsides* must be regarded as holding a still lower rank in the Vegetable Kingdom, and approaching very nearly to those organisms that seem uncertain under which banner to arrange themselves, whether Animal or Vegetable. Viewed by itself indeed *Bryopsis plumosa* appears as perfect a vegetable as any, but taken in connection with neighbouring nearly allied structures *Dasycladus*, *Caulerpa*, *Polyphysa*, *Halimeda*, *Struvea*, &c., it is found to approach much more closely to the confines than would at first sight be supposed.

The first notice we find taken of this elegant plant is by Hudson in whose 'Flora Anglica' it appears under the specific name by which it is most generally known.

Fig. 1. BRYOPSIS PLUMOSA :—*natural size*. 2. Branch. 3. Apex of ditto.
4. Section of branch and ramulus :—*all magnified*.



PLATE CXIX.

BRYOPSIS HYPNOIDES, *Lamour.*

GEN. CHAR. *Fronde* membranaceous, filiform, tubular, cylindrical, glistening, branched; the branches imbricated or distichous and pinnated, filled with a fine green, minutely graniferous fluid. BRYOPSIS (*Lamour.*),— from βρύον, a moss, and ὄψις, an appearance.

BRYOPSIS *hypnoides*; frond slender, very much branched; branches long, repeatedly compound, densely clothed with capillary, elongate ramuli ramellose towards their tips; ultimate ramelli irregularly inserted, erect.

BRYOPSIS *hypnoides*, *Lamour. Journ. Bot.* 1809. p. 135. t. 1. f. 2. *Græv. Alg. Brit.* p. 188. *Hook. Br. Fl.* vol. ii. p. 318. *Wyatt, Alg. Danm.* no. 81. *Harv. Man.* p. 146. *Harv. in Mack. Fl. Hib.* part 3. p. 233.

BRYOPSIS *Arbuscula*, *Ag. Sp. Alg.* vol. i. p. 451. *Ag. Syst.* p. 179. *Kütz. Phyc. Gen.* p. 307.

HAB. On rocks, or parasitical on the smaller *Alga* in submarine tide-pools, in shaded situations, also on *Laminaria saccharina*, beyond tide marks. Annual. Summer. Not uncommon in many places from Orkney to Cornwall and Jersey. Particularly abundant in parts of the west of Ireland.

GEOGR. DISTR. Atlantic shores of Europe. Mediterranean Sea.

DESCR. *Root* composed of branching fibres matted together. *Fronde* densely tufted, from two to six inches long or more, the principal stems as thick as hogs' bristles, repeatedly and excessively branched, the whole frond having a broadly ovate or conical outline. *Branches* crowded, alternate, long and simple, very erect, naked below, above more or less densely clothed with similar irregularly placed lesser branches of much less diameter. These in their turn produce a third series of capillary ramuli, long simple hair-like and very slender, irregularly feathering the apex of the branch from which they spring. Larger specimens only differ from smaller ones in being more repeatedly divided, the system of branching being the same in all. The substance is very lubricous and flaccid, and soon decomposes in fresh water, the membranous wall of the cells bursting, and discharging a fine granular fluid. *Colour* when growing, a peculiarly deep, rich green, when dry, becoming paler, and more yellow. The plant most closely adheres to paper, and the principal stems and branches retain a gloss, as if they had been varnished, but the ramuli are not glossy.

This is a more slender plant than *B. plumosa*, and much more branched; with more abundant, less regular, and longer ramuli, but specimens sometimes occur which show a very close connection between them. On the west of Ireland *B. hypnoides* is

the most abundant, and reaches a size much greater than it attains on the English coast. In sheltered bays, where the broad-leaved variety of *Laminaria saccharina* delights to grow, that plant is often seen covered with thick bunches of this *Bryopsis*, of an extraordinary size and luxuriance. These are never exposed at low water, and can only be reached in a boat; but in shady channels and pools between tide marks, even at some distance above the low water limit, specimens of nearly equal size, attached to smaller Algæ, are frequently met with.

Professor J. Agardh in his excellent work on the Algæ of the Mediterranean, considers our *B. hypnoides* to be merely a more advanced state of *B. plumosa*. It is possible that he may be correct in this conclusion, and I confess that I have sometimes been inclined to a similar opinion, though I do not consider that I have before me sufficient data to warrant my adopting this view of the subject, in opposition to the observations of able naturalists, who have decided in the opposite way. The question is, however, open to further enquiry, and I trust, before the conclusion of this work to be able to speak more decidedly. At any rate the present figure will be useful to contrast with that given at Plate III. of the *B. plumosa* of British writers.

Fig. 1. BRYOPSIS HYPNOIDES :—*the natural size.* 2. Apex of a branch, with its lesser branches. 3. Part of one of the lesser branches, with ramuli :—*both magnified.*

A.



B.

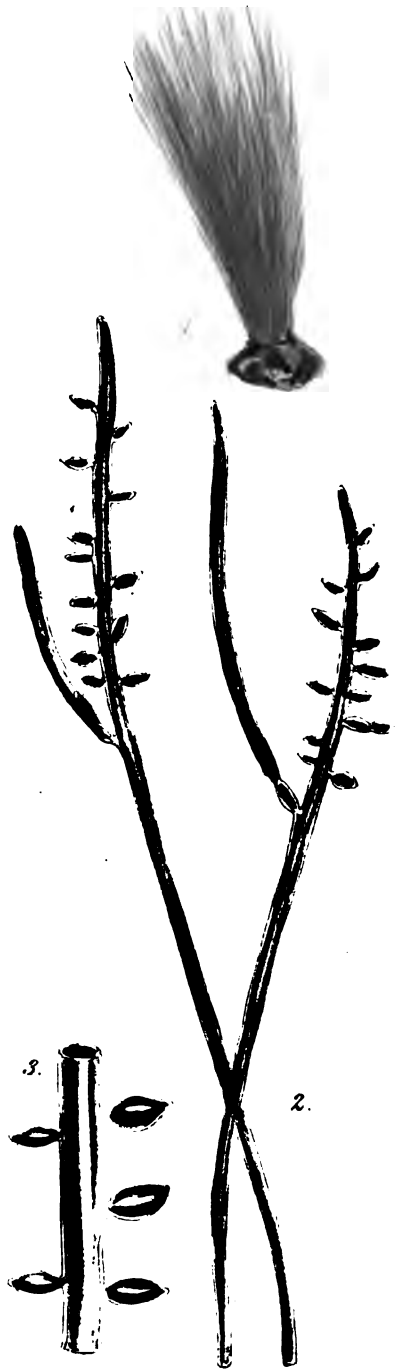


PLATE CCCL. A.

VAUCHERIA MARINA, *Lyngb.*

GEN. CHAR. *Fronde* aggregated, tubular, continuous, capillary, coloured by an internal, green, pulverulent mass. *Fructification*, dark green, homogeneous *sporangia* (*coniocystæ*), attached to the frond.—*Grev.*—VAUCHERIA (DC.),—in honour of *M. Vaucher*, a distinguished Swiss writer upon fresh-water *Confervæ*, &c.

VAUCHERIA *marina*; filaments loosely tufted, or distinct; branches few, very long, obtuse; sporangia solitary, obovate, pedicellate, lateral. *Carm.*

VAUCHERIA *marina*, *Lyngb. Hyd. Dan.* p. 79. t. 22. *Hook. Br. Fl.* vol. ii. p. 319. *Harv. Man.* ed. 1. p. 14. ed. 2. p. 195. *Wyatt, Alg. Danm.* no. 168(?).

HAB. On sea-plants, mud, &c., between tide-marks. Annual. Summer. At Appin, on *Furcellaria fastigiata*, *Capt. Carmichael*. On mud at Torbay and Salcombe, *Mrs. Griffiths and Mrs. Wyatt*.

GEOG. DISTR. Færoe Islands, *Lyngb.*

DESCR. *Fronde* forming more or less dense erect tufts one or two inches in height, very slender and flaccid, irregularly branched, somewhat dichotomous; branches few, erect, their granular contents sometimes interrupted at long interspaces. *Sporangia* few, scattered, broadly obovate or pear-shaped, very obtuse, tapering to the base into a short stalk. *Colour* a bright grass-green, becoming rather brownish, but retaining a gloss in drying.

Not being able to prepare a satisfactory figure of this plant from dried specimens, and not having access to recent ones, I have copied, from the work of Lyngbye, a portion of his figure representing the magnified appearance of a branch in fruit. I regret that I was not earlier aware that a figure of his *V. marina* existed among the manuscript papers of the late Capt. Carmichael; a fact communicated to me since the plate was engraved and printed. Had I known it in time I should naturally have preferred publishing his drawing made from British specimens, to copying the published plate of a foreign author.

A. Fig. 1. Tuft of VAUCHERIA MARINA:—*the natural size.* 2. A portion of a filament in fruit:—*magnified*; copied from *Lyngbye*.

VAUCHERIA SUBMARINA, Berk.

VAUCHERIA *submarina*; "forked fastigiate threads; coniocystæ (sporangia) numerous, lanceolate and ovate, confined to the upper branches."
Berkeley.

VAUCHERIA *submarina*, Berk. *Gl. Br. Alg.* p. 24. t. 8. *Hook. Br. Fl.* vol. ii. p. 319. *Hook. Man.* ed. 1. p. 147. ed. 2. p. 195.

VAUCHERIA *dichotoma*, β . *submarina*, Ag. *Syst. Alg.* p. 171. *Sp. Alg.* vol. i. p. 460. *Lyngb. Hyd. Dan.* p. 76. t. 20. A. *Grav. Alg. Brit.* p. 190.

HAB. On the muddy sea-shore. Weymouth, *Rev. M. J. Berkeley.*

GEOGR. DISTE. North Sea.

DESCR. "*Plant* growing in dense fastigiate masses in muddy spots covered by the sea every tide. Threads far slenderer than in *Vaucheria dichotoma*, stained below by the mud, above dark green, forked; the branchlets generally somewhat stragulated just above their insertion; the main stem clothed, above the part where the branchlet is given off, with numerous, almost sessile, more or less ovate or lanceolate coniocystæ, which are pointed, at first entirely green, but eventually with a pellucid border. One single instance occurred, in which the *fruit* consisted of two, placed end to end."
Berk. l. c.

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I am only acquainted with this species through Mr. Berkeley's description and figure, both of which I have here, with his permission, made use of.

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B. Fig. 1. Tuft of VAUCHERIA SUBMARINA:—*the natural size.* 2. Filaments in fruit:—*magnified.* 3. A portion of a filament with sporangia:—*more highly magnified*; both copied from Mr. Berkeley's plate.

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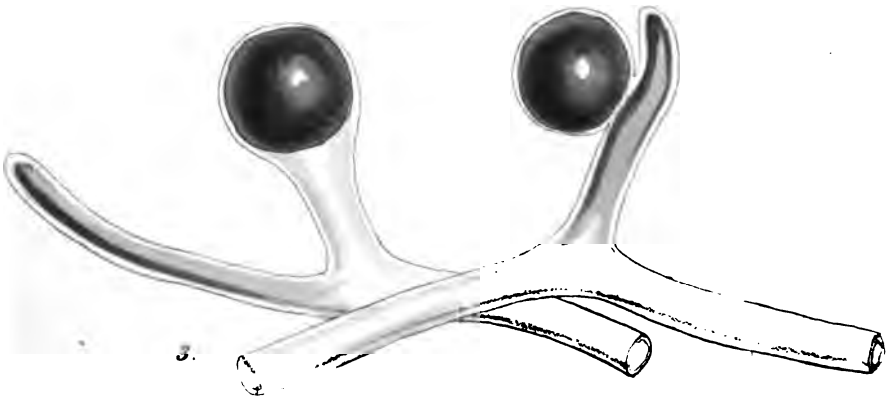




1.



2.



3.

## PLATE CCCXXI.

## VAUCHERIA VELUTINA, Ag.

GEN. CHAR. *Fronde* aggregated, tubular, continuous, capillary, coloured by an internal, green, pulverulent mass. *Fructification*, dark green, homogeneous *sporangia* (*coniocystæ*), attached to the frond.—*Grev.* VAUCHERIA (*De C.*),—in honour of *M. Vaucher*, a distinguished Swiss writer upon fresh-water *Confervæ*, &c.

VAUCHERIA *velutina*; filaments creeping; branches erect, fastigate, woven into a velvety stratum; sporangia solitary, globose, lateral, on short stalks.

VAUCHERIA *velutina*, *Ag. Syst.* p. 312. *Hook. Br. Fl.* vol. ii. p. 319. *Harc. Man.* ed. 1. p. 147. ed. 2. p. 196. *Kütz. Syst. Alg.* p. 487.

HAB. On the muddy sea-shore, and on mud-covered rocks, between tide-marks, generally above half-tide level. Annual. Spring and summer. Appin, *Capt. Carmichael*. Miltown Malbay; Ross Begh; Cushendall, and several other places on the Irish coast, *W. H. H.* (Probably all round the coast.)

GEOGR. DISTR. Shores of Europe.

DESCR. This plant forms widely spreading, velvety patches, from a few inches to several feet in diameter, and from a quarter of an inch to an inch in thickness. The lower part of the mass consists of innumerable, irregularly branching, interwoven, capillary fronds, of a tough membranous consistence; the larger portion of them being usually dead, with a very offensive odour. The upper stratum of filaments alone exhibits marks of vegetation. The greater portion of each filament is decumbent, but here and there it throws up erect, short branches of nearly equal length, or standing at equal height, and these, closely placed together though originating in separate prostrate threads, from the pile of the velvet-like patch. The lower portions of the tubular filamentous frond are colourless and empty—the upper, and especially the erect branches contain a bright green granular fluid. *Sporangia* globose, very dark green with a pellucid border; each borne at or near the apex of a short branchlet. *Colour* of the stratum a dark, shining green, when free from mud, which frequently nearly chokes the plant.

The specimen here figured was gathered at Cushendall, on the Antrim coast, where the plant grows in scattered patches, over rocks slightly coated with mud, and covered by every tide. It was in fructification in August, but appeared to be rather past

its prime. When properly developed, as on flat, muddy shores, the velvety stratum frequently carpets the mud, with its intense green coating, over a very large extent of surface. The filaments of which the mass consists are inextricably and most closely woven together.

To the naked eye *V. velutina* bears a close resemblance to the fresh-water *V. caespitosa*, but is less cushioned, and the upright branches forming the pile are shorter.

I take this opportunity of soliciting freshly gathered and fertile specimens of *V. marina* and *V. submarina*, for the purpose of figuring—or the loan and liberty to use drawings of these species made from the living specimen. Dried specimens of these plants are of little value.

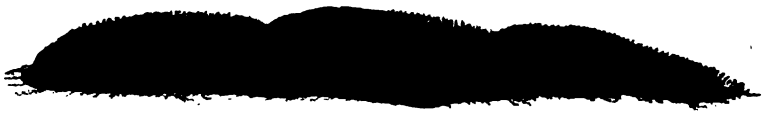
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Fig. 1. Patch of VAUCHERIA VELUTINA :—*the natural size*. 2. Filiform fronds of which the mass is composed :—*magnified*. 3. Small portions of the same, with fructification :—*highly magnified*.

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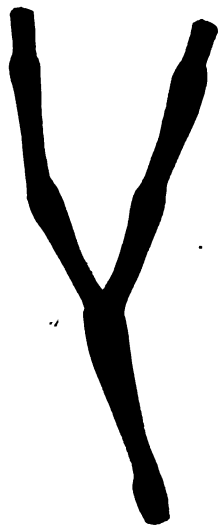
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4

## PLATE XXX.

CLADOPHORA BROWNII, *Harv.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit* aggregated granules or zoospores, contained in the joints, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*)—from κλάδος, a *branch*, and φέρω, *to bear*; a branching plant.

CLADOPHORA *Brownii*; filaments forming dense, cushion-like tufts, erect, rigid, flexuous, elastic, slightly branched; branches few, long, subsimple, secund; axils acute; articulations four or five times longer than broad, the lower ones thickened upwards, the upper cylindrical.

CLADOPHORA *glomerata*, γ. *Brownii*, *Hass. Brit. Fr. Wat. Alg.* p. 213.

CONFERVA *Brownii*, *Dillw. Suppl. t. D. Ag. Syst. Alg.* p. 105. *Harv. in Hook. Br. Fl.* 2. p. 355. *Harv. in Mack. Fl. Hib.* part 3. p. 228. *Harv. Man.* p. 134. *Wyatt, Alg. Danm. N. 225. E. Bot. Suppl. t.* 2879.

CONFERVA *pulvinata*, *R. Br. MSS.*

HAB. In maritime situations exposed to the alternate influence of salt and fresh water; rare. Perennial. On wet rocks in a cave near Dunrea, *R. Brown, Esq.* On rocks at the entrance of a small cave beyond Black Castle, Wicklow (1833), *W. H. H. Cornwall Coast, Mr. Ralfs.*

GEOGR. DISTR. Ireland. Cornwall.

DESCR. *Tufts* very dense, cushion-like, spreading over the rocks in patches of indefinite extent, one to several inches in breadth, from half an inch to nearly an inch in thickness in the middle, gradually thinner towards the edges, of a black-green colour when growing, but exhibiting, on having the water expressed, and being held between the eye and the light, a beautiful clear, yellow-green tint. *Filaments* so matted together that it is difficult to separate a single thread, very rigid, erect, but apparently originating in a mass of creeping, branched, densely matted fibres, which form the base of the tufts, flexuous, irregularly branched; the branches long, simple, secund or subdichotomous. *Articulations* tolerably uniform in length, the lower ones clavate, the upper cylindrical; joints contracted. Endochrome dense.

Perhaps I transgress the true limits of a work on *marine Algæ* by figuring in it a plant which belongs as much to the land as to the sea, and which is only occasionally wet with sea-water. I have two reasons for doing so. First, because the upper figure in the 'Supplement to English Botany', which was obviously made from dried specimens by an artist who had never seen the living plant, is so unlike the living *C. Brownii* that it is quite

useless as a representation of its natural habit ; secondly, because Mr. Hassall, in his recent work, considers *C. Brownii* to be merely a "condition of *C. glomerata*," arising "from the subimmersed habitat in which it grows." This opinion I cannot but regard as being too hasty, especially in an author who had never seen this remarkable plant growing. It is a mere assumption, for there is no evidence to show any passage from the one form into the other ; and the forms themselves are so broadly distinguished that the most casual observer could not confound them. The habit of *Cladophora Brownii* is, as I have long since said, completely that of *Vaucheria terrestris* ; a habit admirably expressed in Mr. Brown's MS. name "*pulvinata*". Such is very different from the sprayey branching of *C. glomerata* ; and if this character be regarded as valueless, we must be prepared to unite a host of other species with *C. glomerata*. But, setting aside habit, the rigid and tough substance of *C. Brownii* distinguishes it, even in fragments, from every form of *C. glomerata* that I have seen. The "Prince of Botanists", who first detected and described it, and whose name it bears, may be allowed to be good authority in this matter. He examined the plant in a recent state ; so have I done ; and so, more lately, has Mr. Ralfs ; and we are agreed in pronouncing it a perfectly distinct species, at least as well characterized as any other specific form in the genus *Cladophora*, and better characterized than several reputed species. I hope the figure now given, and which is a faithful representation of the growing plant, will show that we have some grounds for our opinion.

*Cladophora Brownii* appears to be peculiar to the British Islands, and, so far as I know, has only been found in the stations above given. At Wicklow, I observed it first in 1833 ; and in 1842, when I next visited the station, the plant was still to be found, though not in so luxuriant a state, probably from some failure in the supply of moisture.

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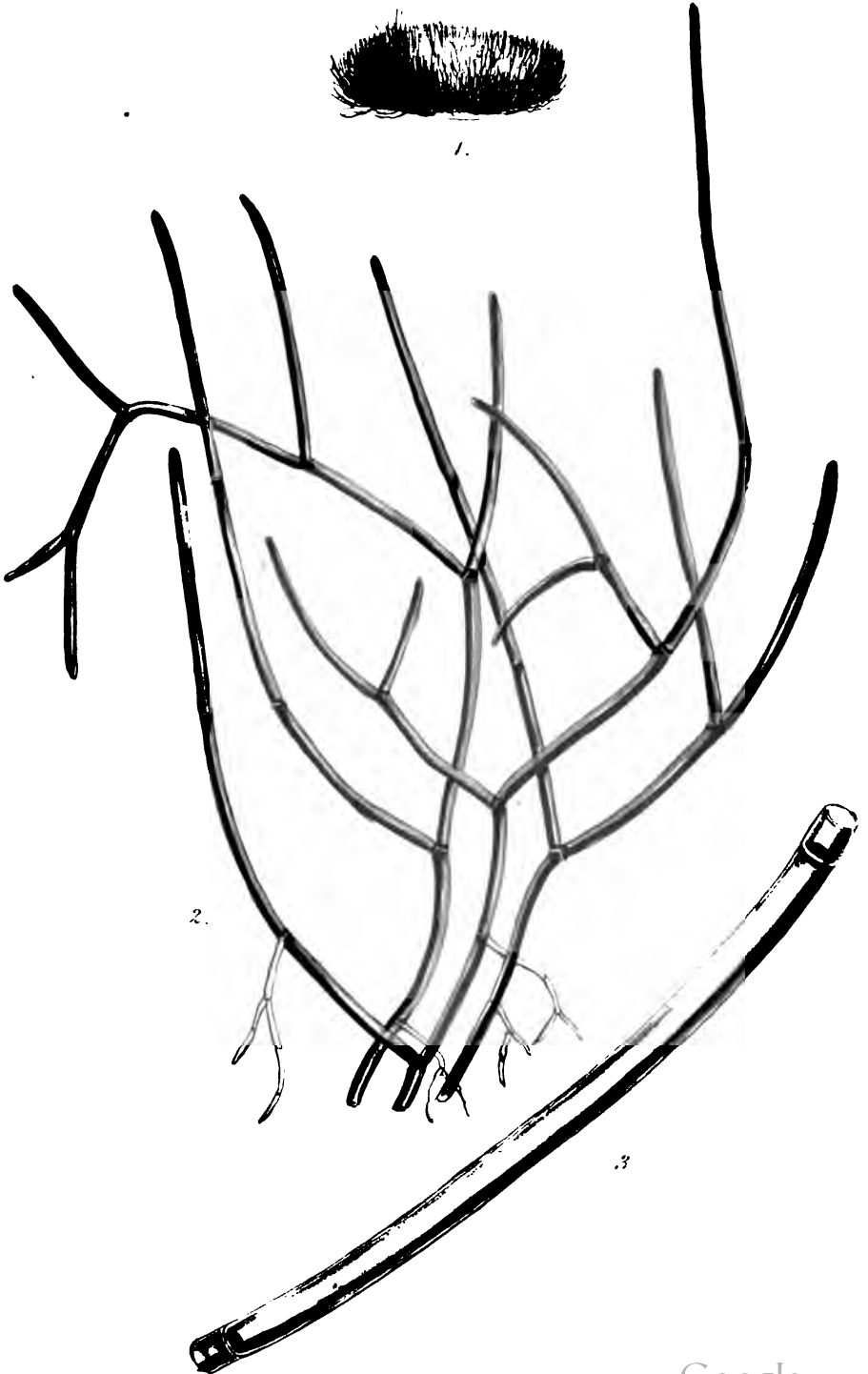
Fig. 1. CLADOPHORA BROWNII :—*natural size*. 2. 3. Filaments removed. 4. Portion of a filament :—*all more or less magnified*.

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1.



2.

3.

## PLATE CCXXXVI.

CLADOPHORA REPENS, *J. Ag.*

GEN. CHAR. *Filaments* green, jointed, uniform, branched. *Fruit* aggregated granules or zoospores, contained in the joints, having, at some period, a proper, ciliary motion. CLADOPHORA (*Kütz.*),— from κλαδος, a *branch*, and φέρω, to *bear*.

CLADOPHORA *repens*; forming dense, cushion-shaped or globular tufts; filaments short, capillary, rigid, densely matted together, rising from root-like fibres; slightly branched; branches erect, subsimple, or forked, naked, or with a few distant, secund ramuli; articulations cylindrical, very long (ten to twenty times as long as their diameter).

CONFERVA *repens*, *J. Ag. Alg. Medit.* p. 13.

EGAGROPILA *simplex*, *Lenorm. in Herb. T. C. D.* (!)

HAB. Thrown on shore after a gale. Annual? Summer. Jersey, *Miss Turner*.

GEOGR. DISTR. Shores of the Mediterranean Sea. Atlantic coast of France, *Lenormand!*

DESCR. *Tufts* very dense, an inch or two in breadth, and about half an inch in thickness, globose or oblong, cushion-like, composed of innumerable, capillary filaments, closely matted together. The filaments are at first decumbent, connected by root-like fibres, which form the substratum of the tufts; from the decumbent filaments issue, at the joints, erect branches, half an inch in length, simple, or once forked, and either naked or furnished with a few simple, distant, secund ramuli. Each branch consists of about four or five, rarely more, articulations; and each ramulus usually of one, rarely of two articulations. The articulations are therefore of great length, as compared with their diameter; in our specimen the length is frequently as much as twenty times the breadth:—they are cylindrical, and the diameter at the tip of the branches is as great as at the base. The *colour* appears to have been a dark green; it is dingy and somewhat olive-green in the dried state. The substance is rigid, and the plant does not adhere to paper when dry.

In a recent number I had the pleasure of figuring a new species of *Dasya* from the shores of Jersey, and I have now to introduce, from the same locality, a *Cladophora*, discovered by my valued correspondent, Miss Turner, to whom I am indebted for many Jersey Algæ. Miss Turner informs me that the specimens were picked up on the beach after a heavy gale, in 1846; four only were found, and the plant has not since been noticed.

From one of these specimens, now in Herb. T. C. D., our figure has been taken.

Of the reference to M. Lenormand's *Egagropila simplex* (seemingly a manuscript name) I am quite certain, a specimen communicated to me by that gentleman agreeing in all respects with Miss Turner's plant; but possibly the reference to the Mediterranean *Conf. simplex*, J. Ag., may be incorrect. And yet I have little hesitation in uniting our plant with that species. They agree in every respect except in the length of the articulations, which, in the Mediterranean plant, are shorter than in ours; and this slight discrepancy seems scarcely sufficient to separate plants so closely allied, by so many remarkable features.

Though not one of the handsomest, this is one of the most curious species of the genus. Outwardly it nearly resembles *C. Brownii*, but the form and proportion of the articulations are very different.

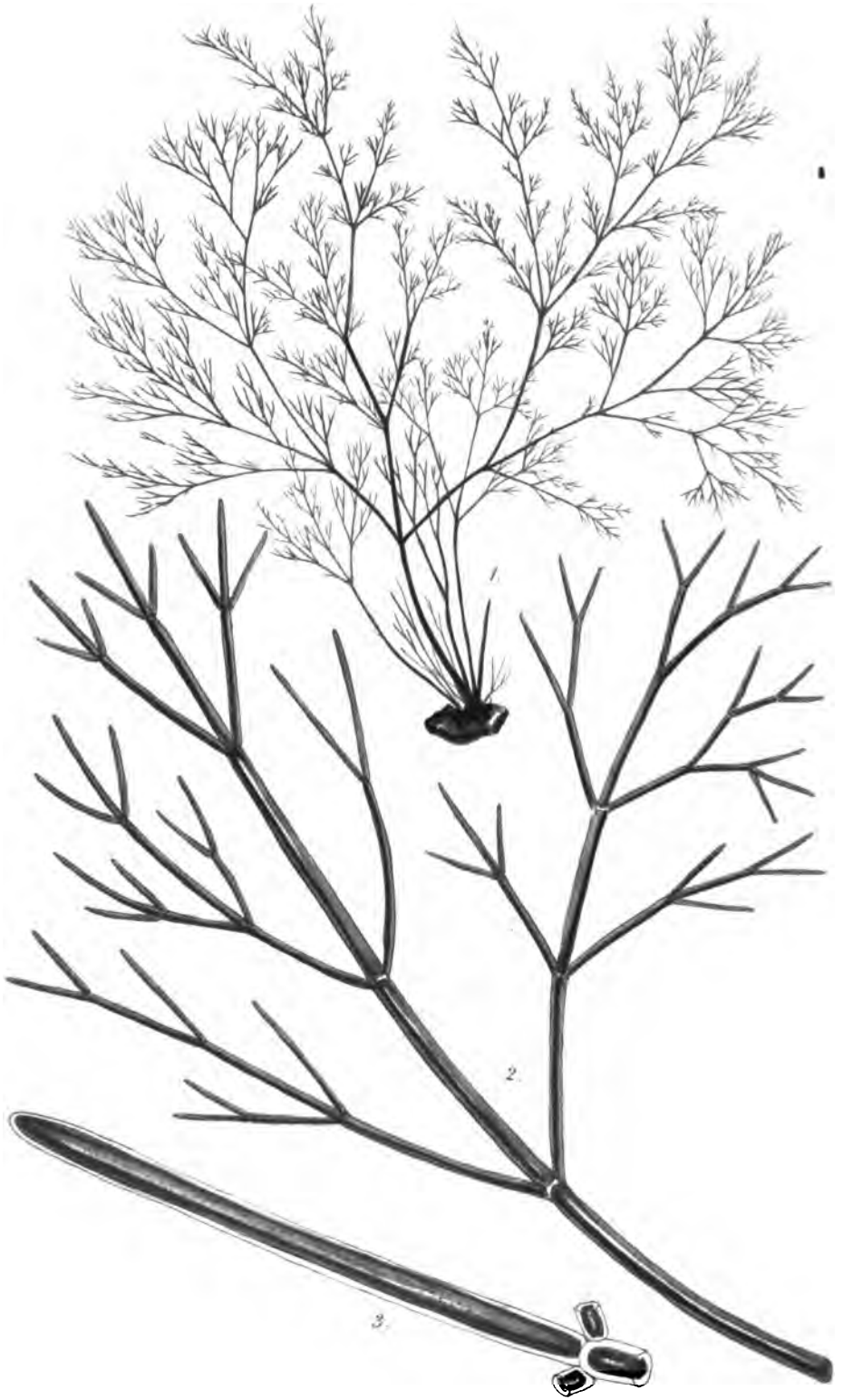
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Fig. 1. CLADOPHORA REPENS; tuft:—of the natural size. 2. Portions of three filaments from the same. 3. An articulation from one of the filaments:—magnified.

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## PLATE CLXXIV.

CLADOPHORA PELLUCIDA, *Kütz.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit*, aggregated granules or zoospores, contained in the articulations, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*), —from *κλαδος*, a *branch*, and *φορεω*, to *bear*.

CLADOPHORA *pellucida*; filaments rigid, erect, setaceous, full dark-green, di-tri-chotomous; the axils very acute, the branches erect; articulations many times longer than broad; dissepiments only at the forking of the branches and ramuli.

CLADOPHORA *pellucida*, *Kütz. Phyc. Gen.* p. 271.

CONFERVA *pellucida*, *Huds. Fl. Ang.* p. 601. *Dillw. Conf.* t. 90. *E. Bot.* t. 1716. *Ag. Syst.* p. 120. *Harv. in Hook. Br. Fl.* vol. ii. p. 357. *Harv. in Mack. Fl. Hib.* part 3. p. 228. *Wyatt, Alg. Danm.* no. 193. *J. Ag. Alg. Medit.* p. 13. *Harv. Man.* p. 135.

HAB. On the bottoms and sides of deep rock-pools, between tide marks, generally near low-water mark; not left dry at low water. Annual? Summer. Not uncommon on the shores of England and Ireland.

GEOGR. DISTB. Atlantic shores of Europe and America. Mediterranean Sea. Cape of Good Hope, *W. H. H.*

DESCR. *Root* scutate, firmly attached to the rock. *Filaments* from three to six or eight inches high, thicker than hogs' bristle, tufted, or subsolitary, extremely rigid, almost wiry, tough and strong, rising with an undivided stem to the height of an inch or more, then either forked or trifurcate, and afterwards repeatedly branched, at short intervals, in a dichotomous or trichotomous manner, some specimens being nearly constantly trichotomous, others dichotomous, and others exhibiting a combination of these methods of branching. Besides this regular ramification, old and luxuriant specimens frequently emit from the forkings, or axils, accessory ramuli more slender than the cells they spring from, but branching in the same manner. Occasionally these are very numerous and densely tufted. *Articulations* one to each *internode* of the branches, many times longer than broad, cylindrical, filled with dense fluid matter, which is usually dissipated in drying, when the plant fades to a pale green, preserving a somewhat glazed lustre, like that of *Bryopsis*. In drying it adheres very imperfectly to paper.

It is pleasant in such a genus as *Cladophora*, where the species often seem to run insensibly into one another, to find one so broadly distinguished from the rest that there can be no mistake about it. The plant here figured is just of this character. *Cladophora pellucida* may at once be known by its very distinct

di-trichotomous branching, and by there being but a single articulation or *cell* in the space intervening between each furcation; that is to say, every *internode* consists of a single cell. There is no other British species in which this takes place regularly, in all parts of the frond. It thus happens that the individual *cells*, in this species, are of extraordinary length, those of the lower parts of the filament being sometimes more than an inch in length, very frequently three quarters of an inch.

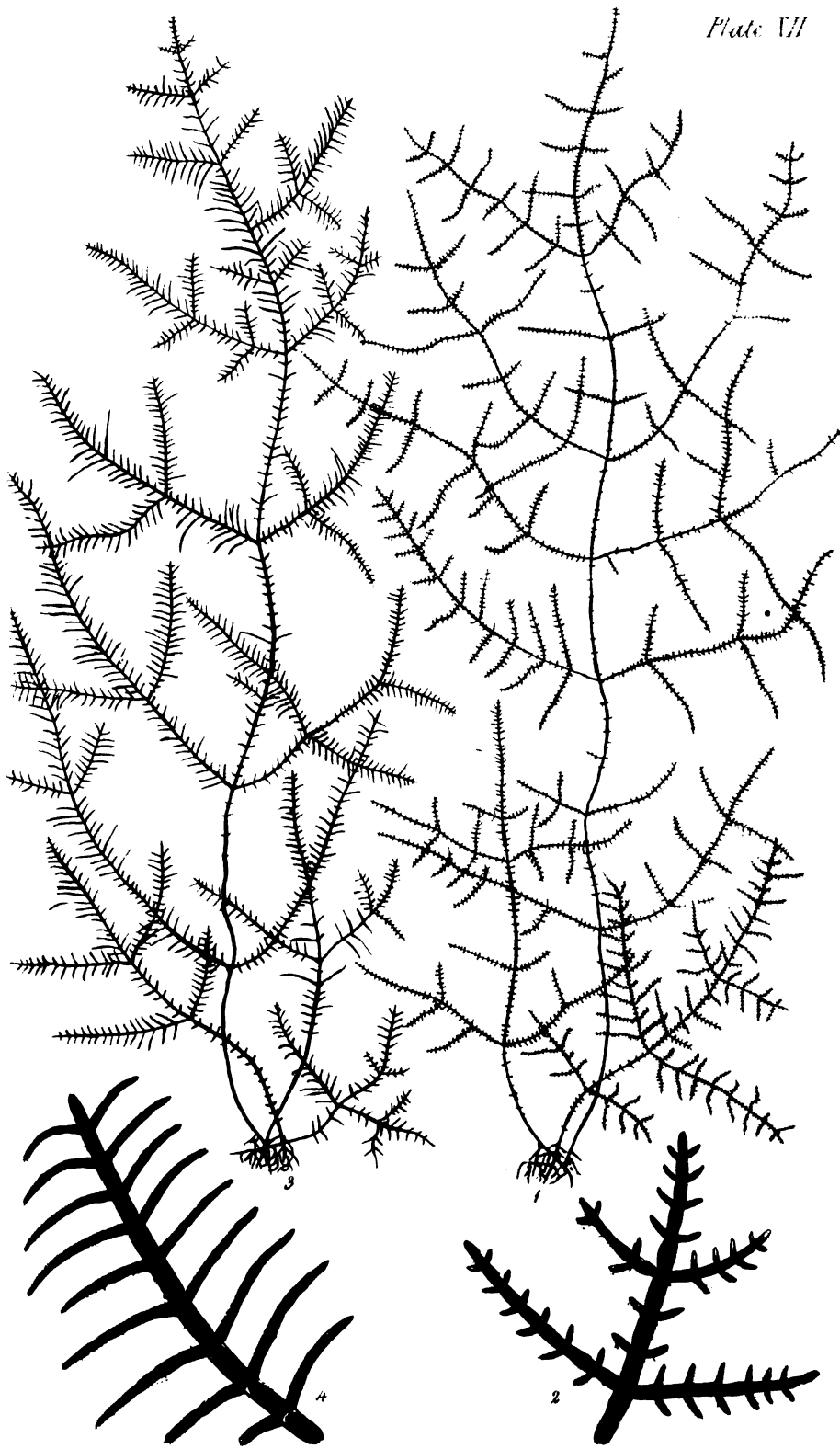
*Conferva pellucida* was first described by Hudson, in the *Flora Anglica*, and has been adopted by all subsequent authors with the exception of Lyngbye, who unaccountably confounds it with *C. rupestris*, a plant which is well distinguished by the difference in its articulations, if there be no other character, as there are many, to separate it. Hudson's expression "*articulis cylindricis longissimis*," is alone characteristic of *C. pellucida*.

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Fig. 1. CLADOPHORA PELLUCIDA :—of the natural size. 2. Portion of a branch  
—magnified. 3. Terminal articulation of the same :—more highly magnified.

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## PLATE XII.

CLADOPHORA RECTANGULARIS, *Griff.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit*, aggregated granules or zoospores, contained in the joints, having, at some periods, a proper, ciliary motion. CLADOPHORA—from *κλάδος*, a branch, and *φέρω*, to bear; a branching plant.

CLADOPHORA *rectangularis*; filaments setaceous, rigid, forming intricate tufts; branches opposite, distant, elongated, patent, furnished throughout with short, opposite, horizontal ramuli; articulations twice or thrice as long as broad.

CONFERVA *rectangularis*, *Griff. MSS. Harv. in Hook. Br. Fl.* vol. ii. *Addenda*, p. 10. *Wyatt, Alg. Danm.* no. 145. *Harv. Man.* p. 135.

CONFERVA *Crouani*, *Chauv. MSS. sec. Berk. in Litt.*

HAB. In the sea, at depths beyond the influence of the tides. Annual. Summer. Torquay, cast on shore, very rare; *Mr. Borrer* and *Mrs. Griffiths*. Galway, *Mr. Reilly*. Dredged in Roundstone Bay, county of Galway, in 4–6 fathoms, very abundant, *Mr. W. M'Calla*. Abundant at Great Arran, Galway Bay, *Mr. Andrews*.

GEOGR. DISTR. South of England, very rare. Abundant in certain districts of west of Ireland, but very local. Coast of Normandy.

DESC. *Filaments* as thick as horse-hair, 8–12 inches long, forming tufts which are often much entangled together, divided irregularly into three or four principal branches, or with an undivided stem. *Branches* very patent, issuing nearly at right angles, distant, opposite, or by abortion occasionally alternate, simple, or furnished with a second series of lesser branches which are equally patent and opposite, rarely naked, mostly furnished throughout their length with short, opposite, horizontal, simple, jointed ramuli, which issue either from every joint of the branches and stem, or at every third or fourth joint. These are occasionally ternate or quaternate. The ramuli vary considerably in relative length in different specimens, being in some individuals (as in fig. 1) not half a line in length, in others (fig. 3) 3–5 lines; and, in a specimen now before me, from half an inch to an inch. In this last case the long ramuli are comparatively few, and mixed with others of the usual length. *Colour*, a full, bright green, fading in the herbarium. Substance when quite fresh, crisp and rather rigid, soon becoming flaccid, but never adhering strongly to paper. Articulations of uniform length throughout the plant, twice or thrice as long as broad; joints slightly contracted.

A beautiful species, discovered in the year 1832 by Mr. Borrer, washed up on the beach at Torquay, and occasionally found, but very rarely, in the same locality by Mrs. Griffiths and Mrs. Wyatt. Of the date of its discovery in Normandy I am not informed,

but have reason to believe it subsequent to the publication of the English station. Mr. Mc'Calla was the first to detect it on the Irish coast, in the year 1840, and to him we owe the knowledge of its occurrence in plenty in Roundstone Bay, county of Galway. He describes it as covering the bottom of the bay in wide spreading strata, at a considerable depth for an individual of this genus, and as being, towards the close of the summer, washed up in very large quantity, so as to be carted off by the country people for manure. This will sound strangely in the ear of an English botanist accustomed to save the minutest scrap as a prize, or to spend hours in the disentangling of a specimen rolled together by the waves; but Mr. Mc'Calla's statement is confirmed by our friend Mr. Andrews, who observed it cast up in similar abundance at Arran.

No species can be more distinct. The very patent, opposite branches, and the invariably opposite, distichous, horizontal ramuli are its peculiar characteristics. It is most nearly related to *C. Hutchinsiae* and *C. diffusa*, of which it has the size, rigidity, and something of the habit. But the opposite ramuli clearly separate it from either. Both the varieties represented in our plate are from Roundstone Bay.

I cannot find that it has been noticed in any continental work. The name, given by Chauvin, under which it was received from M. Lenormand by Mr. Berkeley, does not appear to have been published, and this is the only continental authority which I have been able to ascertain for the species.

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Fig. 1, CLADOPHORA RECTANGULARIS, var.  $\alpha$ :—*natural size*. 2. Portion of the same:—*magnified*. 3. Var.  $\beta$ :—*natural size*. 4. Portion of the same:—*magnified*.

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PLATE LXXXIV.

CLADOPHORA MACALLANA, *Harv.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit*, aggregated granules or zoospores, contained in the joints, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*)—from *κλάδος*, a branch, and *φορέο*, to bear.

CLADOPHORA *Macallana*; filaments setaceous, rigid, full green, very flexuous, loosely bundled together, excessively branched; branches alternate or rarely opposite, zigzag, very patent; ramuli short, recurved, simple, or pectinated, obtuse; articulations twice or thrice as long as broad; endochrome rather dense.

HAB. On the sandy bottom of the sea, in 4–10 fathom water. Annual. Summer. Dredged in Roundstone Bay, abundantly, *Mr. Mc'Calla*.

GEOGR. DISTR. West of Ireland.

DESCR. *Root* not exactly known. *Filaments* forming crisped subcylindrical bundles from six to twenty inches in length, rigid, bristling (not collapsing) when removed from the water, of a rich, shining, grass-green colour, much branched, and inextricably tangled together, rather brittle. *Branches* very flexuous or bent in a zigzag manner, irregular in length and disposition, sometimes opposite, more usually alternate or secund; sometimes divided in a sub-dichotomous manner, very patent, with wide axils; furnished with a second and third series of smaller branches, and these clothed at short intervals with short ramuli. *Ramuli* alternate or secund, very patent or reflexed, short, cylindrical, obtuse, either simple or more usually pectinated on their upper side with short, one- or two-jointed processes. *Apices* all very blunt. *Endochrome* rather dense, recovering its form, in a degree, when moistened after having been dried. In drying it very imperfectly adheres to paper.

This handsome *Cladophora* was, in 1840, communicated to me by Mr. Mc'Calla, as a new species, but it was not until last summer that I had an opportunity of seeing it in its place of growth, and examining it in a fresh state. At Roundstone, in August, I dredged it in considerable plenty, and convinced myself that it was quite distinct from any described British species; and as I have reason to believe it to be new to botanists, it gives me great pleasure to give it the name of its discoverer, who has well earned such a tribute by the many additions he has made both to the Fauna and Flora of the west of Ireland; and who is now engaged in the preparation of an

excellent work containing dried specimens of Irish Algæ, one volume of which has already appeared.\*

Professor Kützing, who has studied this puzzling genus with much care, and to whom I sent a specimen, writes me that it is quite new to him, and that he considers it to be a good species, allied indeed to *C. alyssoides*, Menegh., "but more rigid, less thick, with longer joints, and a different ramification." Mrs. Griffiths has also expressed a similar opinion.

When growing, it has very much the appearance, at first sight, of *C. rectangularis*, so much so, indeed, that until the ramification be closely looked to, and the *alternate* or *secund* ramuli be observed, it might be mistaken for that species. It grows in the same locality, and occurs in similar loosely-bundled masses, and often accompanies *C. rectangularis* in the same dredge. It possesses the same rigid substance as that species, and the same glossy, bright green colour, except when it is, as most of my specimens are, infected with *Cocconeis aggregata*, which as Dr. Kützing remarks, not only change its colour, but prevent its adhering to paper.

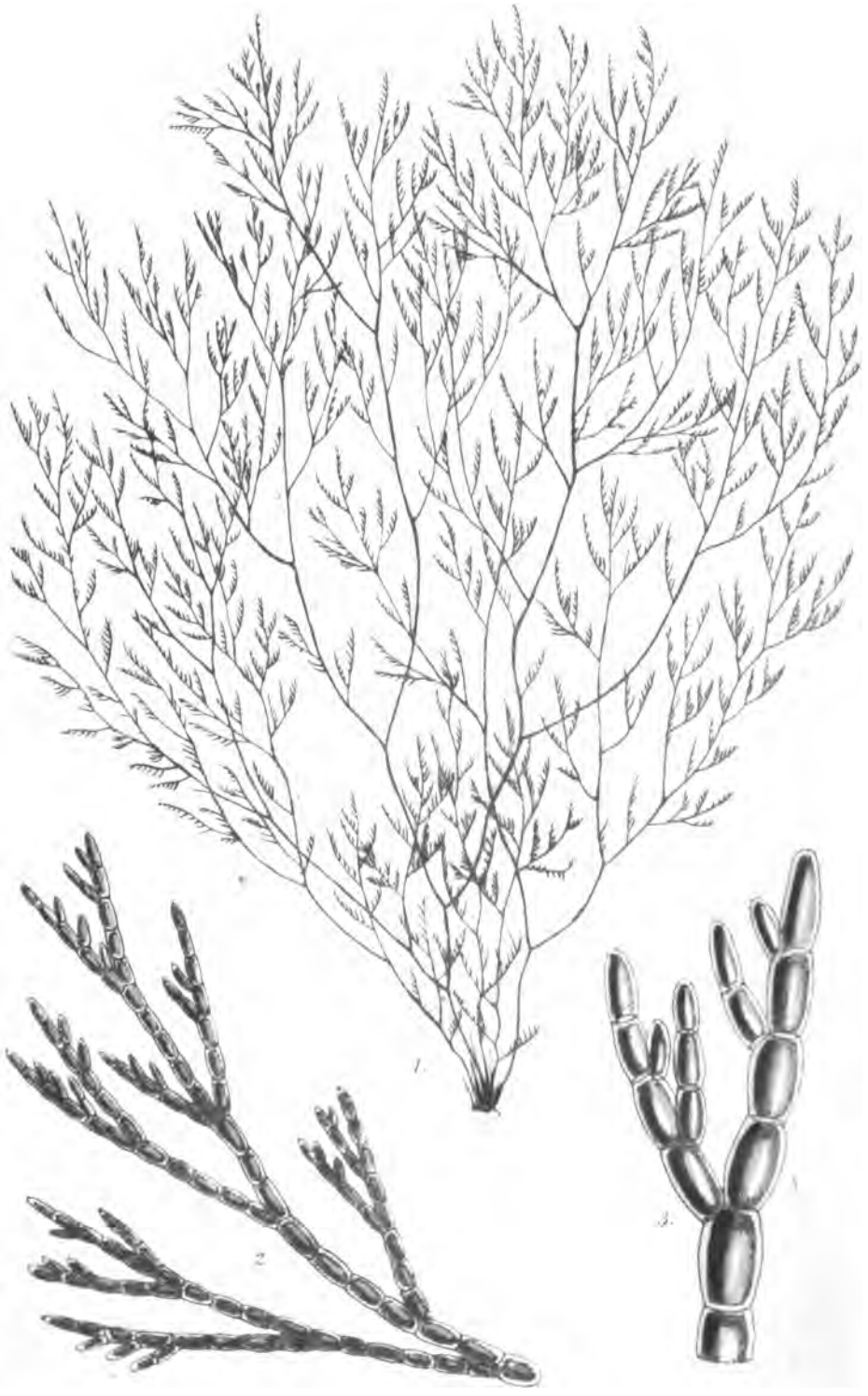
\* "Algæ Hibernicæ," by William Mc'Calla, Associate of the Edinburgh Botanical Society. S. B. Oldham, Dublin. 1845. Imp. 4to.

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Fig. 1. CLADOPHORA MACALLANA :—*of the natural size.* 2. Part of a filament :—*magnified.* 3. Ramulus :—*more highly magnified.*

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W. J. S. et al.

## PLATE CXXIV.

CLADOPHORA HUTCHINSIÆ, *Harv.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit* aggregated granules or zoospores, contained in the joints, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*),—from *κλαδος*, a branch, and *φορεω*, to bear.

CLADOPHORA *Hutchinsiae*; filaments setaceous, of equal diameter throughout, rigid, crisp, glaucous-green, flexuous, tufted, bristling; ramuli erecto-patent, simple or furnished along the inner face with short processes of one or two articulations; apices very obtuse; articulations twice or thrice as long as broad, the joints contracted.

CONFERVA *Hutchinsiae*, *Dillw. Conf. t.* 109. *Harv. in Hook. Br. Fl.* vol. ii. p. 357. *Harv. in Mack. Fl. Hib.* part 3. p. 229. *Harv. Man.* p. 135. *Wyatt, Alg. Danm.* no. 226.

HAB. On the rocky bottoms of clear tide-pools, near low-water mark. Annual. Summer. Rather rare. Bantry Bay, *Miss Hutchins. Larne, Dr. Drummond. Tor Abbey, Mrs. Griffiths. Belfast Bay, Mr. W. Thompson. Ardrossan, Major Martin. Saltcoats, Rev. D. Landsborough. Salcombe, Mr. Ralfs.*

GEOGR. DISTR. Atlantic shores of Europe?

DESCR. *Filaments* as thick as horse-hair, or sometimes thicker, from six to twelve inches or more, long, densely tufted, but not massed together, rigid, the branches standing out from one another, and bristling when removed from the water, repeatedly but very irregularly divided. In some specimens the filaments are very much branched; in others subsimple or a few times forked. *Branches* long, flexuous, generally bending in graceful curves, sometimes zigzag, more or less compound, furnished with short, alternate or secund, scattered, erecto-patent ramuli, which are often simple, and often furnished on their inner faces with several secund processes, the whole ramulus resembling a little comb. *Articulations* tolerably uniform in all parts of the plant, about twice as long as broad, occasionally somewhat longer, containing a bag of dense, granular, deep green endochrome. *Joints* slightly contracted. *Apices* very obtuse, and not in the least attenuated. *Colour* when growing, a beautiful glaucous green, appearing, when viewed in the water, almost white; when dry, varying according to age, from a yellow-green to a deep grass-green.

A very beautiful and strong-growing species, discovered about the year 1808, by the late Miss Hutchins, of Ballylicky, near Bantry, whose explorations of her neighbourhood were as unre-mitted as they were successful; and whose name is deservedly held in grateful remembrance by botanists, in all parts of the

world. To her the botany of Ireland is under many obligations; particularly the Cryptogamic branch, in which field, till her time but little explored, she was particularly fortunate in detecting new and beautiful objects, several of which remain among the rarest species to the present day. Mr. R. Brown, "the Prince of Botanists," has dedicated the genus HUTCHINSIA, consisting of several pretty alpine species of Cruciferous plants, to her memory; and Agardh, the great Swedish Alogologist, had, about the same time, selected the beautiful and extensive genus now called *Polysiphonia*, for a like purpose. Most lovers of marine botany will regret that the priority in point of publication attaches to the Cruciferous genus; and that therefore the name of Miss Hutchins can only be associated in a minor degree with the tribe of plants to which she was especially attached. But Miss Hutchins was not a mere Algologist: she cultivated with equal ardour every department of Natural History, and to her may most justly be applied the lines quoted by Mr. Turner when concluding a grateful tribute to her memory, in the last page of his 'Historia Fucorum'.—

"In every season of the beauteous year  
Her eye was open, and with studious love,  
Read the Divine Creator in his works.  
Chiefly in thee, sweet Spring, when every nook  
Some latent beauty to her wakeful search  
Presented, some sweet flower, some virtual plant.  
In every native of the hill and vale  
She found attraction; and where beauty failed,  
Applauded odour or commended use."

*Cladophora Hutchinsiae* is very closely allied to *C. diffusa*; but the filaments are of greater diameter, the ramuli more abundant and shorter, and the joints shorter and generally contracted at the dissepiments.

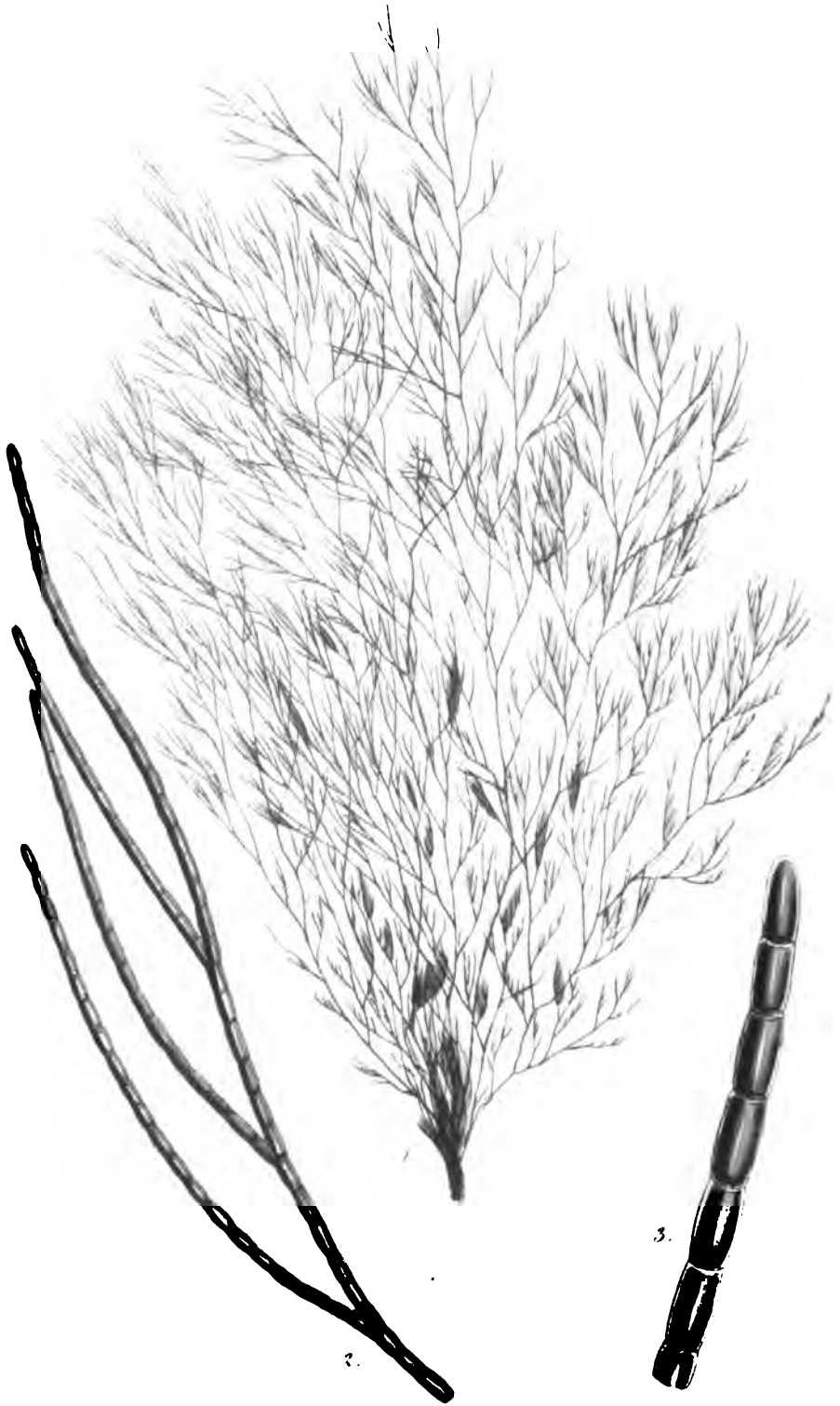
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Fig. 1. CLADOPHORA HUTCHINSIÆ:—of the natural size. 2. Part of a filament. 3. Small portion of the same:—both magnified.

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## PLATE CXXX.

CLADOPHORA DIFFUSA, *Harv.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit*, aggregated granules or zoospores, contained in the joints, having at some period a proper ciliary motion. CLADOPHORA (*Kütz.*),—from κλάδος, a *branch*, and φέρω, to *bear*.

CLADOPHORA *diffusa*; filaments sub-setaceous, loosely tufted, rigid, dark or full green, flexuous, much branched; branches distant, elongated, irregularly subdivided, or somewhat dichotomous, furnished towards the top with a few secund, simple ramuli; articulations 3–4 times longer than broad.

CONFERVA *diffusa*, *Roith, Cat. Bot.* vol. ii. p. 207. t. 7. *Dillw. Conf.* t. 21. *E. Bot.* t. 2289. *Ag. Syst.* p. 116. *Harv. in Hook. Br. Fl.* vol. ii. p. 358. *Harv. in Mack. Fl. Hib.* part 3. p. 229. *Harv. Man.* p. 136. *Wyatt, Alg. Danm.* no. 144. *J. Ag. Alg. Medit.* p. 13.

CONFERVA *distans*, *Ag. Syst.* p. 120.

HAB. On rocks and stones between tide marks, and in clear pools near low-water mark. Annual. Summer. Near Swansea, *Dillwyn*. Torbay, *Mrs. Griffiths*. Falmouth, *Miss Warren*. Aberffraw, *Mr. Ralfe*. Sidmouth, *Rev. R. Cresswell*. Malbay, *W. H. H.*, and in other places. Port Rush, *Mr. Moore*.

GEOGR. DISTR. Atlantic shores of Europe. Mediterranean Sea.

DESCR. *Filaments* from six to twelve inches long, or more, as thick as horsehair, cylindrical, equal, loosely tufted, generally so rigid as to bristle and stand out, one from another, when removed from the water; occasionally flaccid, flexuous, much branched. *Branches* rather distantly placed, long, irregularly subdivided in a manner between alternate and dichotomous, sometimes repeatedly, sometimes but slightly branched, the lesser divisions either long, simple, and quite naked, or bearing towards their extremities a few simple secund ramuli. *Joints* tolerably uniform in all parts of the frond, twice, thrice or four times as long as broad. *Colour*, when young, a full and rather dark, glossy green, afterwards paler and more yellowish. In drying, the plant adheres, but not strongly, to paper.

The *Conferva diffusa* of British authors, here figured, is, perhaps, scarcely sufficiently distinct from *Cladophora Hutchinsæ*, represented in Plate CXXIV. As already remarked, it is more slender than the typical form of that species, its branches are less frequently divided, the ramuli longer, more distant and simple, the joints longer, and the substance less firm and rigid.

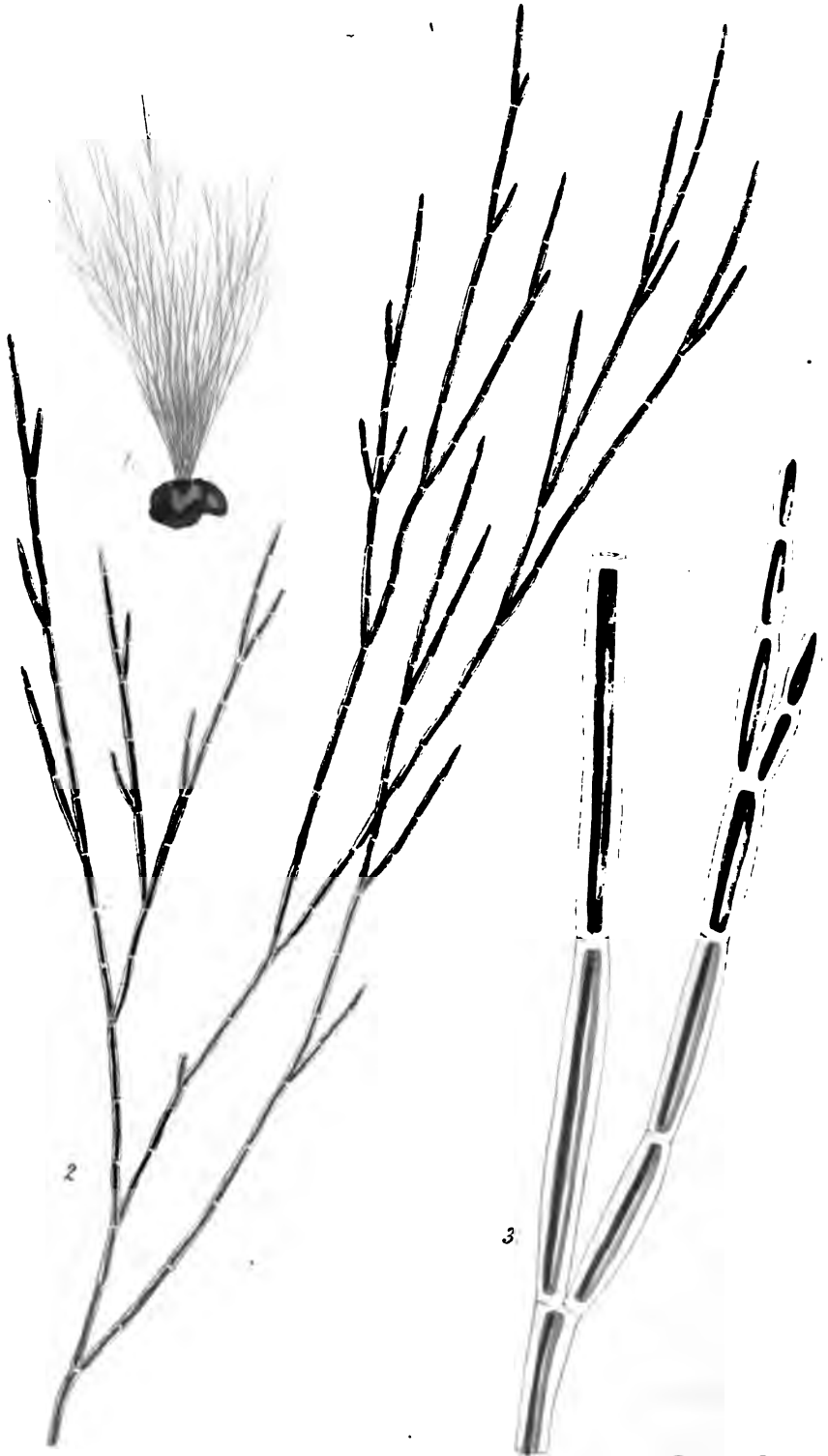
Still specimens frequently occur which seem to connect the two.

This species was discovered by the late Professor Mertens, on the coast of Holland, about the close of the last century, and first published by Roth, in his 'Catalecta.' Mr. Dillwyn soon afterwards detected it near Swansea. It does not appear to be uncommon on the rocky parts of our shores, growing generally in clear water, and most frequently in deep pools near low-water mark. Seen under water it has much of the glaucous colour of *C. Hutchinsiae*; sometimes it occurs of a darker green, and then approaches some of the less branched forms of *C. rupestris*, but is a larger and stronger growing plant.

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Fig. 1. CLADOPHORA DIFFUSA:—*of the natural size.* 2. Part of a filament.  
3. Apex of a branchlet:—*both magnified.*





## PLATE CCCLI.

CLADOPHORA NUDA, *Harv.*

GEN. CHAR. *Filaments* green, attached, uniform, branched, composed of a single series of cells or articulations. *Fruit*, aggregated granules or zoospores, contained in the articulations, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz*),—from *κλαδος*, a *branch*, and *φορεω*, to *bear*.

CLADOPHORA *nuda*; filaments somewhat rigid, slender, very straight, dull-green, or olivaceous (when dry), sparingly dichotomous; ramuli few and scattered, appressed, the uppermost often opposite; articulations many times longer than broad.

CLADOPHORA *nuda*, *Harv. Man.* ed. 2. p. 101.

CONFERVA *nuda*, *Harv. in Mack. Fl. Hib.* part 3. p. 229. *Harv. Man.* ed. 1. p. 136.

HAB. On basalt rocks, between tide-marks. At Port Stewart, co. Antrim, *Mr. D. Moore*.

GEOGR. DISTR. — ?

DESCR. *Filaments* loosely tufted, two or three inches high, capillary, sparingly branched, very straight, irregularly forked or sub-alternately divided; secondary branches distant and very erect, of various lengths, naked, or furnished with a few very erect or appressed, short ramuli, the upper ones of which are occasionally opposite. These ramuli are scarcely more slender than the other parts of the frond, and end in a bluntish point. The *articulations*, in the older parts, are many times longer than their breadth, and have thick walls, leaving a wide space surrounding the dull-green endochrome; the dissepiments are slightly contracted. The substance is rather rigid, and without gloss; and in drying the plant does not adhere to paper.

My knowledge of this species, if the plant here figured be entitled to rank as a species, is confined to a specimen collected by Mr. Moore, many years ago, on the coast of Antrim, and now preserved in the Dublin University Herbarium. It is undoubtedly nearly related to *C. rupestris*, from which, at first sight, it differs by its duller colour and more naked branches, and especially by the much longer articulations of the stem, and the wider borders of the tube. Still, I fear this character of long

joints, which is the strongest of those mentioned, is not to be altogether counted on; for though I have not observed the joints in any specimen of *C. rupestris* to be of the extreme length of those of *C. nuda*, yet I have seen a tendency in some specimens of that species to produce long joints; and this, joined to the non-occurrence in recent times of *C. nuda*, has latterly disposed me to consider it a variety of *C. rupestris*. As, however, it has already obtained publicity both in this country and on the Continent, I think it deserving of being figured in this work, and shall be happy to find that future researches prove its title to receive a name. Last summer (1850) I sought for it diligently on the basaltic rocks in the neighbourhood of the Giant's Causeway, but in vain; and it was out of my power to extend the exploration as far as Port Stewart.

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Fig. 1. CLADOPHORA NUDA:—*the natural size.* 2. Portion of a branch:—*magnified.* 3. Ramuli:—*more highly magnified.*

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## PLATE CLXXX.

CLADOPHORA RUPESTRIS, *Kg.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit*, aggregated granules or zoospores, contained in the joints, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*),—from *κλαδος*, a *branch*, and *φορεω*, to *bear*.

CLADOPHORA *rupestris*; filaments capillary, rigid, dark green, straight, tufted, bushy; branches erect, crowded, densely clothed with appressed, opposite, or tufted, subulate ramuli; articulations three or four times longer than broad.

CLADOPHORA *rupestris*, *Kütz. Phyc. Gen.* p. 270.

CONFERVA *rupestris*, *Lim. Sp. Pl.* p. 1637. *Huds. Fl. Ang.* p. 601. *Lightf. Fl. Scot.* p. 994. *With. Br. Pl.* vol. iv. p. 140. *Fl. Dan.* t. 948. *Roth, Cat. Bot.* vol. ii. p. 238. *Dillw. Conf.* t. 23. *E. Bot.* t. 1699. *Ag. Syn.* p. 91. *Lyngb. Hyd. Dan.* p. 156. t. 54. *Ag. Syst.* p. 117. *Harv. in Hook. Br. Fl.* vol. ii. p. 357. *Wyatt, Alg. Danm.* no. 95. *Harv. in Mack. Fl. Hib.* part 3. p. 229. *Harv. Man.* p. 136.

CONFERVA *glauca*, *Roth, Cat. Bot.* vol. ii. p. 208. t. 6.

CONFERVA *virgata*, *Roth, Cat. Bot.* vol. i. p. 195.

Var.  $\beta$ . *distorta*; tufts rooting in the mud, depressed; filaments short, much curled, and matted together; ramuli squarrose.

HAB. On rocks in the sea, between tide-marks; also beyond the limits of low water. Annual. Summer and autumn. Abundant on all the British shores.  $\beta$ . On submarine peat, at Birturbui Bay, Connemara, *Mr. Mc Calla*.

GEOGR. DISTR. Atlantic shores of Europe. Baltic Sea.

DESCR. *Root* (except in var.  $\beta$ .) scutate. *Filaments* densely tufted, from four to six or eight inches in length, thicker than human hair, very much branched. *Branches* virgate, long, straight, repeatedly divided, set with opposite or quaternate, very erect, lesser branches, which are more or less furnished with ramuli. *Ramuli* closely appressed, subulate, tapering to a fine point, opposite, or occasionally alternate, or three or four rising from the same articulation, the pairs more or less approximating together. *Articulations* from three to five times longer than broad, slightly contracted at the dissepiments, filled with a dense endochrome. *Substance* rigid, not adhering to paper in drying. *Colour* a beautiful dark green, sometimes, especially when growing in deep water, reflecting glaucous tints.

A very beautiful plant, when well grown, common on all our rocky shores, and extending through the whole of the littoral zone, even into the belt of the *Laminariæ*. Specimens gradually increase

in luxuriance, and in the purity and depth of their colour, as their habitat is remote from high water ; and those which are collected in deep rock-basins, at the verge of the tide, are remarkably handsome. So common a plant could not escape notice from the earliest time, and consequently we find it mentioned both in Theophrastus and Dioscorides. A characteristic figure, for the age, is given by Dillenius ; and it received its present name in the Species Plantarum of Linnæus.

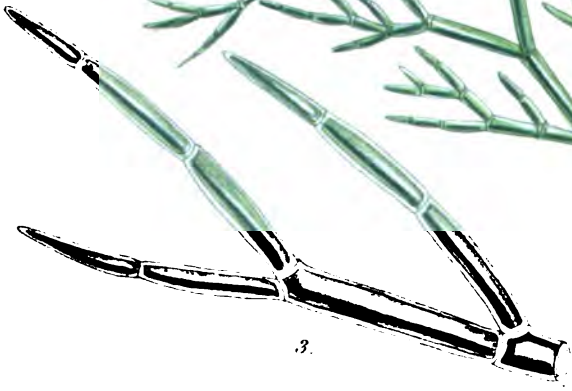
Though it varies in some degree in the number of its ramuli, which on some specimens are closely crowded together, distant and few on others ; yet there is always such a similarity in habit between all states of the plant, and such an identity of colour (and that a remarkably *dark* colour for the genus), that few persons who have once seen this species will mistake it for anything else. The only puzzling variety which I have met with is what I have called var.  $\beta$ . *distorta*, and this is only puzzling if seen for the first time in the study. In the field it still retains so much of the appearance of stunted forms of the species, that its difference of general habit does not deceive a practised eye ; and its *habitat* is quite sufficient to account for the distorted forms it assumes. It is found, in the locality indicated, forming scab-like patches on the naked surface of the peat, just within the limit of the tide, in company with *Codium amphibium* and *Catenella opuntia*. A habitat more unlike that usually occupied by *C. rupestris* can scarcely be imagined. The species is therefore struggling hard against circumstances, on the confines of its capability of growing.

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Fig. 1. CLADOPHORA RUPESTRIS—tuft:—*of the natural size*. 2. Portion of a branch:—*magnified*. 3. Some of the ramuli:—*more highly magnified*.

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3.

## PLATE CXC.

CLADOPHORA LÆTEVIRENS, *Kütz.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit* aggregated granules or zoospores, contained in the joints, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*),—from *κλαδος*, a *branch*, and *φορεω*, to bear.

CLADOPHORA *lætevirens*; filaments much branched, bushy, forming tufts of a transparent, yellow-green colour, faded, and without gloss when dry; branches erecto-patent, crowded, repeatedly divided, flexuous, the lesser divisions often opposite; ultimate ramuli secund, blunt, of few articulations; articulations of the branches six times, of the ramuli thrice, as long as broad.

CLADOPHORA *lætevirens*, *Kütz. Phyc. Gen.* p. 267.

CLADOPHORA *ægæa*, *Kütz. Phyc. Gen.* p. 266 (P)

CONFERRA *lætevirens*, *Dillw. Conf. t.* 48. *E. Bot. t.* 1854. *Harv. Man.* p. 137. *Lyngb. Hyd. Dan.* p. 154. *Ag. Syst.* p. 107. *Harv. in Hook. Br. Fl. Hib.* part 3. p. 228. *Wyatt, Alg. Danm.* no. 143.

CONFERRA *glomerata*, *β. marina*, *Roth. Cat. Bot.* vol. iii. p. 237. *Lyngb. Hyd. Dan.* p. 154. *Ag. Syst.* p. 107. *Harv. in Hook. Br. Fl.* vol. ii. p. 357. *Harv. in Mack. Fl. Hib.* part 3. p. 228. *Wyatt, Alg. Danm.* no. 143.

HAB. On rocks, stones, and Algæ, between tide marks. Annual. Summer. Frequent on most of our rocky shores.

GEOGR. DISTR. Atlantic shores of Europe and North America.

DESCR. *Root* scutate. *Filaments* as thick as human hair, or somewhat more robust, 6–8 inches long, densely tufted, and very much branched; the main divisions somewhat zigzag, the lesser branches patent, spreading on all sides, unequal in length, set with two or more series of smaller branchlets, the last of which are frequently opposite. Ultimate *ramuli* one or two lines long, composed of three or four cells, somewhat curved, secund, obtuse, spreading. *Articulations* of the main divisions and larger branches several times longer than broad, of the ramuli about thrice as long, full of a bright endochrome, which is unequally dispersed when the plant is placed in fresh water. *Colour* a fine yellow-green, more or less discharged in drying. *Substance* membranaceous, soft, adhering, but not very firmly, to paper.

A common species on most of our rocky shores, and widely dispersed through the northern Atlantic. Forms nearly resembling it, though they may appear under different specific names, are found in most parts of the world, within temperate latitudes. It was first proposed as a distinct species by Dillwyn, who draws attention to its peculiarly pale green colour and bushy mode of

growth. These characters, taken in addition to the robust threads, spreading branches, and blunt ramuli may serve to distinguish it from our other marine kinds, but it is more difficult to point out characters by which it may be known from a fresh-water species, *C. glomerata*. Almost all authors, indeed, who have written on the genus seem disposed to regard *C. læte-virens* as a marine variety of *C. glomerata*, attributing what minor differences may be seen to a difference of locality. This is the view taken by Agardh, and adopted in Hooker's British Flora. Mrs. Griffiths, however, who has paid much attention to plants of this genus, and to whose acute eye we owe the detection of more than one new form among them, is of a different opinion, and, at her instance, I have in another place restored *C. læte-virens* to the catalogue: whilst I express my doubts of the propriety of such a step. Among such imperfect plants *habitat* may, perhaps, be admitted as a character of no ordinary importance, and if we allow it in the present case, there can be no difficulty in the matter; for *C. læte-virens* is found in the open sea, beyond all influence of fresh water, and *C. glomerata* in rills and rivers remote from the sea, and often high among the hills. Practically, therefore, and as far as *collectors* are concerned, the plants may be allowed to be distinct. But when we come to speak of the physical distribution of species, it should be borne in mind that these marine and fresh-water plants are, perhaps, different states of the same thing. A similar instance of an Alga growing in the open sea and in fresh water, occurs in *Bangia fusco purpurea*, which is often found in fresh-water streams in very inland situations; but instances of such indifference in *habitat* are very unusual.

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Fig. 1. CLADOPHORA LÆTEVIRENS:—*of the natural size.* 2. Part of a branch.  
3. Ramuli:—*more or less highly magnified.*

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## PLATE CCCLIII.

CLADOPHORA FLEXUOSA, *Griff.*

GEN. CHAR. *Filaments* green, attached, uniform, branched, composed of a single series of cells or articulations. *Fruit*, aggregated granules or zoospores, contained in the articulations, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*),—from κλαδος, a *branch*, and φέρω, to *bear*.

CLADOPHORA *flexuosa*; filaments capillary, flexuous or angularly bent, pale green, much branched, the branches of unequal length and (comparatively) but little divided, set with curved secondary or tertiary branches, which are pectinated with secund, short, simple, spreading ramuli; articulations of the branches thrice or four times, of the ramuli twice as long as broad.

CLADOPHORA *flexuosa*, *Griff.*! in *Wyatt, Alg. Danm.* no. 227. *Harv. Man.* ed. 2. p. 202 (in part; the synonyms of Dillwyn and Eng. Bot., there quoted, being doubtful.)

CLADOPHORA *sirocladia*, β *gracilis*, *Kütz. Sp. Alg.* p. 392.

HAB. In rock-pools, between tide-marks, attached to other Algæ. Torquay, *Mrs. Griffiths*. (Other recorded stations require re-examination and verification.)

GEOG. DISTR. (Doubtful.)

DESCR. *Filaments* capillary, three to six inches long, tufted, much branched, but not so densely bushy as several allied species, the principal branches angularly bent, and the secondary and tertiary branches, which are long and of unequal lengths, bent from side to side in an undulating manner. From the projecting angles of the bent branches, at either side, spring other lesser laterals, which are usually simple, and either naked, or more commonly pectinated along one side with several short ramuli, each of four or five articulations. These ramuli on some specimens are found lengthening out into branches, and again bearing ramuli. All the divisions are curved. The articulations in the stem are from three to four times as long as broad, not contracted at the joints; those of the ramuli are gradually shorter, and very little contracted, expanding nearly to their full shape when moistened after having been dried. The colour is a pleasant green, tolerably retained in drying. The substance is membranaceous, and the plant adheres to paper.

Not being in possession of any authentic specimen of the *Conferva flexuosa* of Dillwyn, on which the present species is supposed to be founded; and, also, having good reason to doubt

the identity of the plant here figured with that figured by Dillwyn, I think it best to abstain quoting any synonym or habitat which I have not recently verified. My figure and description therefore have reference alone to the specimens published by Mrs. Griffiths in Wyatt's 'Algæ Danmonienses,' and to such as agree with them in character. I am not very sanguine of the validity of this species, and, notwithstanding some differences in minor characters, would place it near *C. glaucescens*, to which it is closely related. The general aspect is not unlike that species, and the articulations are of about the same length; but here the stem and branches are more flexuous, the ramuli shorter in proportion, and the dissepiments are less contracted. I am not disposed to place much reliance on any of these characters.

Meanwhile, as the plant has been published in a work of such celebrity as the 'Algæ Danmonienses,' it is right that it should have a place in our volumes.

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Fig. 1. CLADOPHORA FLEXUOSA :—*the natural size*. 2. Portion of a filament :—*magnified*. 3. Small portion of the same :—*more highly magnified*.

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## PLATE XVIII.

CLADOPHORA GRACILIS, *Griff.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit*, aggregated granules or zoospores, contained in the joints, having, at some period, a proper ciliary motion. CLADOPHORA—from *κλαδός*, a *branch*, and *φορέω*, to *bear*; a branching plant.

CLADOPHORA *gracilis*; filaments very long, capillary, flexuous, silky, much branched, bright yellow green; main branches entangled, sparingly divided, angularly bent; ultimate ramuli pectinate, secund, much attenuated, straight and very long; articulations 3–5 times longer than broad.

CONFERVA *gracilis*, *Griff. in Wyatt. Alg. Danm.* n. 97. *Harv. in Mack. Fl. Hib.* part 3. p. 230. *Harv. Man.* p. 137.

HAB. Growing on *Zostera*, and the larger *Alga*, in 4–5 fathoms. Annual. Summer. Torbay, *Mrs. Griffiths*. Youghal, *Miss Ball*. Belfast Bay, and Ballantræ, Ayrshire, *Mr. W. Thompson*.

GEOGR. DISTR. Shores of the British Islands. Coast of Sweden, *Areschoug*.

DESCR. *Filaments* forming soft, silky tufts, 6–14 inches long, with something of a main stem, from which spring very numerous, long, and much divided, angularly twisted branches, plentifully clothed with comb-like branchlets, whose secund ultimate ramuli are very slender, elongated, erecto-patent, and straight or slightly incurved. *Colour* a fine rich yellow green, which fades in some degree when the plant is dried, but a silky gloss is generally retained. *Articulations* tolerably uniform throughout the frond, 3–5 times longer than broad. *Substance* soft and pliant, not gelatinous, and the plant adheres but imperfectly to paper in drying.

I received this plant in 1833, from Mrs. Griffiths, under the specific name here adopted; and not long afterwards excellent specimens were published by Mrs. Wyatt, in her “*Algæ Danmonienses*,” so often quoted. As far as British species are concerned the student will find little difficulty in recognizing it; the only ones with which it can be confounded are *C. flexuosa*, than which it is much more luxuriant, more glossy, and more branching; and *C. Kaneana* (Mc’Calla) which is softer, more flaccid, and much more slender and delicate. But the exotic species of this puzzling genus have not been sufficiently compared together to judge to which of them it most nearly approaches, or whether it may

not be identical with some European form which passes under a different name. I have sometimes feared that it should be referred to *C. sericea* of Roth.

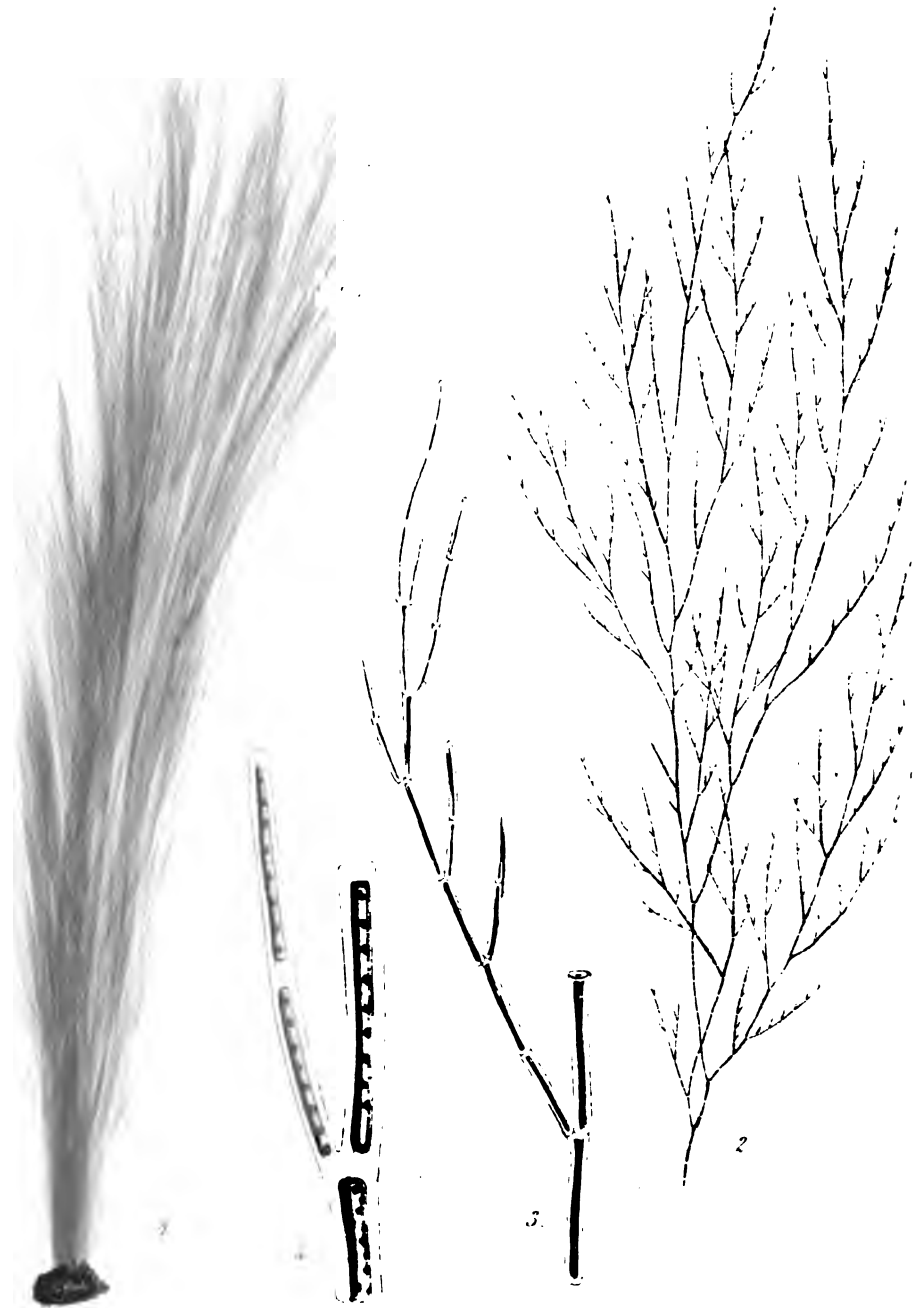
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Fig. 1. CLADOPHORA GRACILIS :—*natural size*. 2. Fragment :—*magnified*

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## PLATE CCCLVI.

CLADOPHORA BALLIANA, *Harv.*, n. sp.

GEN. CHAR. *Filaments* green, attached, uniform, branched, composed of a single series of cells or articulations. *Fruit*, aggregated granules or zoospores, contained in the articulations, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*),—from *κλαδος*, a *branch*, and *φορεω*, to *bear*.

CLADOPHORA *Balliana*; filaments elongate, extremely slender, soft, grass-green, much branched; the branches excessively divided, the penultimate ones virgate, and set with slender, secund, one- or two-jointed ramuli; articulations of the branches eight or ten times as long as broad, of the ramuli six to eight times, all filled with dense, granular endochrome; dissepiments broad and hyaline.

HAB. Sea-shores. At Clontarf, *Miss Ball* (May 16, 1843).

GEOGR. DISTR. — ?

DESCR. *Filaments* finer than human hair, from six to eight or ten inches long, tufted and much branched, the branching repeatedly alternate, but irregular and difficult to trace; with a more or less evident leading stem. Lesser branches one or two inches long, somewhat virgate, undivided, set with other minor branches, which again bear numerous short, pectinate ramuli, generally along their inner faces. These ramuli are much more slender than the joint from which they spring, and usually consist of but two cells, but occasionally lengthen out into several. The branches and lesser divisions taper, at the extremity, into a slender point. The endochrome filling the cells is remarkably dense, granular, and in great measure recovers its form on remoistening after the plant has been dried; and is of a full grass-green. The length of the cells in the principal divisions is from eight to ten times their diameter, or perhaps more; in the ramuli the cells are shorter. The border of the tube and the dissepiments are both very wide in proportion to the part occupied by endochrome. The substance is soft and tender, and the plant closely adheres to paper in drying.

I am glad, in closing the 'Phycologia,' to have an opportunity of paying a grateful tribute to the fair discoverer of the present beautiful species, from whom I have, during the course of this publication, received much assistance—in supplies of specimens, &c.—and to whose acute eye the Irish Flora is indebted for the addition of many interesting species. *Cladophora Balliana*, not the least beautiful of these, is readily known from all its British

congeners but one, by the tenuity and lubricity of the filament, in conjunction with the great length of the cells. The only species with which it can be confounded is *C. Rudolphiana*, but the ramification is so different in that plant, that, notwithstanding a near agreement in the length of the articulations and the general aspect of the tufts, there can be little difficulty in distinguishing one from the other.

As yet I have only seen the specimens collected by Miss Ball, so long ago as 1843. As I have been in no haste to publish it as a novelty, I hope it may stand permanently as a good species.

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Fig. 1. CLADOPHORA BALLIANA :—*the natural size*. 2. Portion of a filament :—*magnified*. 3. Branchlet, and 4, part of the same :—*less and more highly magnified*.

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PLATE LXXXVI.

CLADOPHORA RUDOLPHIANA, *Kütz.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit*. aggregated granules or zoospores, contained in the joints, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*)—from κλάδος, a branch, and φορέο, to bear.

CLADOPHORA *Rudolphiana*; filaments very long, exceedingly slender, flexuous, subgelatinoso-membranaceous, much branched, brilliant, yellow-green, inextricable; branches, di-trichotomous, or irregular; ultimate ramuli pectinate, secund, very long and much attenuated; articulations of the main filaments many times longer than broad, here and there swollen, their granular endochrome somewhat spiral; those of the ramuli 6–10 times as long as broad.

CLADOPHORA *Rudolphiana*, *Kütz. Phyc. Gen.* p. 268.

CONFERYA *Rudolphiana*, *Ag. in Bot. Zeit.* vol. x. p. 636. *J. Ag. Alg. Medit.* p. 12.

CONFERYA *Kaneana*, *Mc'Calla. Alg. Hib.* no. 29.

HAB. Parasitical on *Zostera*, the various *Laminariæ* and other sea plants, in 2–6 fathom water. Annual. Summer. Very abundant in Roundstone Bay, Cunnemara, *Mr. Mc'Calla.* Falmouth, *Miss Warren.*

GEOGR. DISTR. Adriatic Sea, *Agardh!* (*v. in Herb. Hook.*)

DESCR. *Filaments* exceedingly slender, forming very flaccid, subgelatinous tufts from six to twenty inches in length, excessively branched, and in most cases inextricably entangled. The branching appears to be an irregular combination of dichotomous, and alternate, with here and there some opposite branches; and all the main divisions are either very flexuous or angularly bent. The ultimate ramuli are very long, attenuated to a fine point, and disposed in secund, subpectinate groups. Frequently one of the joints swells into an elliptical or spindle form, but without much apparent alteration in its nature. All the joints are of great length, as compared with their diameter, those of the main filaments being upwards of ten times longer than broad; those of the ramuli from six to ten times. Their endochrome is lax, pellucid, and its granules are attached in subspiral lines to the walls of the cells. The colour is a rich glossy green; the substance very soft; and the whole plant adheres closely to paper in drying, and preserves its colour.

One of the commonest sea plants in Roundstone Bay, Cunnemara, where it infects every object on which it can lay hold, at a depth of from two to six fathoms, or perhaps more. It is very frequently found on the *Laminariæ*, on *Zostera*, &c. Whilst young, and freely waving in the water, it is a very beautiful

object; but in age its tufts become drawn out to a great length, and its filaments twisted into green, mucous ropes, which stick to any object which comes near them. The botanist who dredges where this plant grows, however much he may admire it on the first few hauls, will soon wish that it was not quite so affectionate.

In this country it was first noticed by Mr. Mc'Calla, who, observing that it was different from any British species, and believing it to be new, published specimens in his 'Algæ Hibernicæ,' under the name *Conferva Kaneana*, dedicating the species to Lady Kane, authoress of 'The Irish Flora,' who happened to be in the boat when the plant was discovered. I should have adopted this name had I not found, in Sir W. J. Hooker's rich Herbarium, a specimen of the *C. Rudolphiana*, of Agardh, communicated by that author, which agrees in all essential particulars with our Irish plant; as does also the short description given by Agardh, in the 'Bot. Zeitung.'\* Professor Kützing, however, informs me that what he has received under the name *C. Rudolphiana*, from Biassoletto, is a different plant, and that Agardh has distributed several different species under this name. This may possibly be so, yet I can hardly set aside the authority of the original specimen above mentioned; supported by the character—a very unusual one—of the occasional swelling of the joints, which I observed before I had seen Agardh's, *C. Rudolphiana*, or was aware what character he had assigned to it.

Among British species, the nearest affinity of *C. Rudolphiana*, is with *C. gracilis*, with which it agrees in the ramification, and in the great length of the alternate ramuli. But its filaments are very much more slender, its substance softer, and more flaccid, and its joints very much longer. The *great* length of the joints will also distinguish it from *C. albida*, which it likewise resembles.

\* *C. Rudolphiana*; filis di-trichotomis ramosissimis attenuatis mucosis, articulis diametrum pluries superantibus, hic illic in globos ellipticos inflatis. *Ag.* in *Bot. Zeit.* vol. x. p. 636.

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Fig. 1. CLADAPHORA RUDOLPHIANA :—*of the natural size.* 2. A portion of a branch. 3. A joint from the filaments. 4. One of the swollen joints :—*all more or less magnified.*

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## PLATE XXIV.

CLADOPHORA REFRACTA, *Kütz.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit*, aggregated granules or zoospores, contained in the joints, having, at some period, a proper, ciliary motion. CLADOPHORA—from *κλάδος*, a branch, and *φορέω*, to bear; a branching plant.

CLADOPHORA *refracta*; filaments capillary, somewhat rigid, tufted, bright green, very much branched; secondary branches spreading on all sides, repeatedly divided, thickly clothed with very much spreading or reflexed, short branchlets, which are pectinated with ramuli on their upper surface; articulations twice or thrice as long as broad.

CLADOPHORA *refracta*, *Kütz. Phyc. Gen.* p. 267.

CONFERVA *refracta*, *Roth. Cat.* vol. ii. p. 193. *Ag. Syst.* p. 114. *Harv. Man.* p. 137. *Wyatt, Alg. Danm.* no 228.

HAB. In rocky pools, left by the tide, near low water mark. Annual. Summer. Dunlecky Castle, Kilkee, *W. H. H. Ilfracombe, Mrs. Griffiths.* Mangans Bay, Cork, *Miss Ball.* Giants' Causeway, *Mr. W. Thompson.* Jersey, *Miss Turner.* Falmouth, *Miss Warren.* Mounts Bay, and Torbay, *Mr. Ralfs.* Howth and Balbriggan, *Miss Gower.*

GEOGR. DISTR. Baltic Sea. Shores of the British Islands.

DESCR. *Filaments* densely tufted, 3–4 inches high, slender, rather rigid; the main stems often woven or matted together in rope-like bundles, the secondary branches free, spreading on all sides and much divided; the ultimate branchlets very patent or reflexed, frequently opposite, pectinated on their upper face. Very frequently a minute ramulus stands opposite to a pectinated branchlet, several of which follow each other in a secund manner along the stem. *Colour* a brilliant yellowish green, peculiarly glossy when the plant is growing, and partially preserved in drying. *Substance* rather harsh for so slender a plant, very imperfectly adhering to paper.

If our reference to Roth be correct, the present plant was discovered by M. Trentepohl on the shores of the duchy of Oldenburg, about the year 1799, and has been detected since that period on many of the coasts of northern Europe. Specimens communicated to me by M. Areschoug, of Gottenburg, precisely agree with those from the British coasts. It was probably confounded by earlier British writers with *C. albida*, not having been recognized

as British until I gathered it in the year 1833. So many habitats have since been recorded for it, that it may be regarded as a generally distributed *form*, if not *species*.

It most nearly agrees in character with *C. albida*, but the filaments are coarser, and far more rigid, standing out from each other when the tuft is removed from the water; the colour is a brighter and fuller green; the ultimate branches are shorter and more patent, often strongly reflexed, and the general habit is by no means spongy.

It appears to prefer the clearest and purest water, growing on the bare rock or among corallines in deep cold pools left by the tide, near the extreme of low water mark. Where I have seen it, both at Kilkee and Dingle, it could only be reached at spring tides.

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Fig. 1. CLADOPHORA REFRACTA:—*natural size*. 2. Portion of a filament.  
3, 4. Ramuli:—*more or less highly magnified*.

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## PLATE CCLXXV.

CLADOPHORA ALBIDA, *Kütz.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit*, aggregated granules or zoospores, contained in the articulations, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*), —from *κλαδος*, a *branch*, and *φορεω*, to *bear*.

CLADOPHORA *albida*; filaments exceedingly slender, flaccid, pale yellow green (whitish when dry), forming dense, silky, or somewhat spongy, soft, intricate tufts; branches crowded, irregular, the uppermost patent and mostly opposite; ramuli opposite or secund; articulations four or five times as long as broad.

CLADOPHORA *albida*, *Kütz. Phyc. Un.* p. 267. *Sp. Alg.* p. 400. *Hassall*, p. 224.

CONFERVA *albida*, *Huds. Fl. Ang.* p. 595. *Dillw. Conf.* p. 66. t. E. *E. Bot.* t. 2327. *Harv. in Hook. Br. Fl.* vol. ii. p. 358. *Harv. in Mack. Fl. Hib.* part 3. p. 229. *Harv. Man.* ed. 1. p. 138. *Wyatt, Alg. Danm.* no. 96.

HAB. On rocks and Algæ, between tide-marks, usually near low-water mark. Annual. Summer. Not uncommon on the southern shores of England, and the south and west of Ireland.

GEOGR. DISTR. Shores of Europe?

DESCR. *Tufts* six to twelve inches long, dense, soft and silky, retaining water like a sponge. *Filaments* inextricable, often rolled together below into thick rope-like bundles, mostly free and feathery above, exceedingly slender and excessively branched. It is impossible to follow the branching through the whole plant, but when small fragments broken from the lesser divisions are placed under the microscope, the branching seems partly opposite and partly secund: the penultimate branchlets are usually opposite and very patent; the ultimate ramuli generally short and secund. The upper branches are not much more slender than the lower, and the articulations, throughout the frond, are nearly uniformly from four to five times as long as broad. The colour is a pale, and peculiarly pleasant, yellowish green, fading in the herbarium to a dull whitish green without gloss. The substance is soft and flaccid, and the plant adheres pretty strongly to paper in drying.

A handsome species, and one of the earliest recognized, distinguished from most of our common kinds by the tenuity and softness of the filaments, their length, and the uniformly short articulations. It is most nearly related to *C. refracta*, with which Agardh unites it, but is a taller plant with less patent and

less compound ramification, a softer substance, a paler colour, and altogether a different aspect. I confess, however, that it is difficult at all times to affix clear limits between these species. Neither are uncommon on rocky shores between tide-marks.

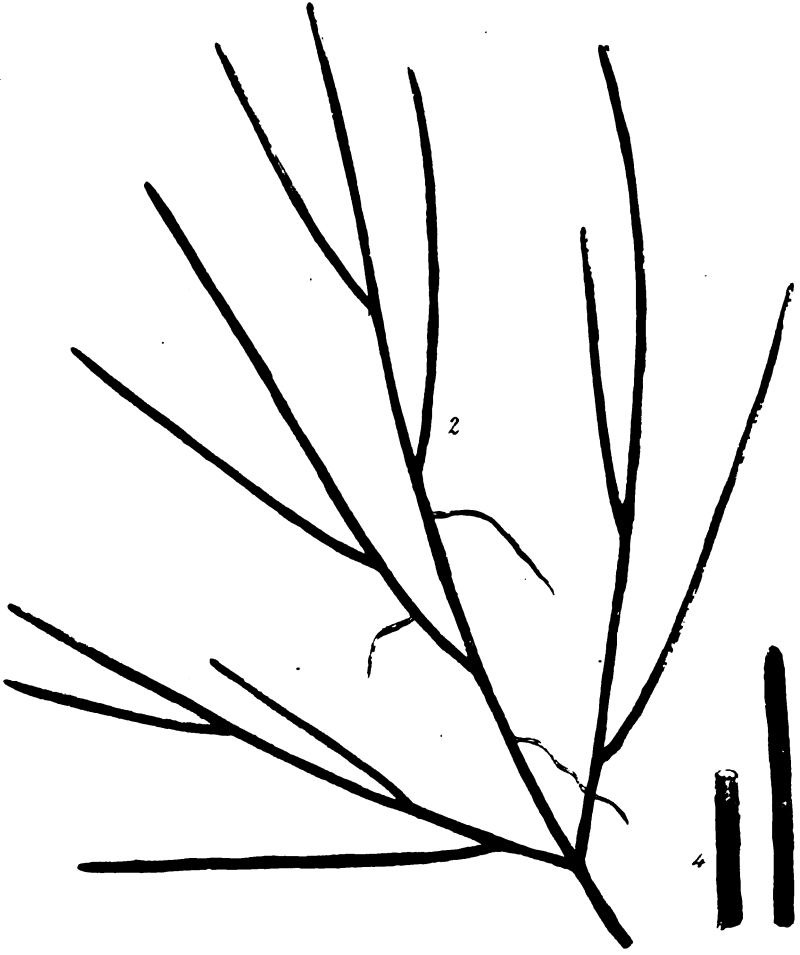
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Fig. 1. CLADOPHORA ALBIDA :—*the natural size*. 2. Small part of a branch,—*magnified*. 3. Ramuli :—*more highly magnified*.

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## PLATE VI.

CLADOPHORA LANOSA, *Kütz.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit*; aggregated granules or zoospores, contained in the joints, having, at some period, a proper ciliary motion.

CLADOPHORA *lanosa*; *Filaments* slender, short, yellow green, forming dense globular tufts; branches virgate, erect, subdistant, straight, alternate or rarely opposite; ramuli few, alternate or secund; axils very acute; lower joints twice, upper six times, as long as broad.

CLADOPHORA *lanosa*, *Kütz. Phyc. Gen.* p. 269.

CONFERVA *lanosa*, *Roth. Cat. Bot.* vol. iii. p. 291. t. 9. *Sm. E. Bot.* t. 2099.

*Lyngb. Hyd. Dan.* p. 160. t. 56. *Dillw. Conf. t. E. Ag. Syst. Alg.* p. 112.

*Grœv. Fl. Edin.* p. 316. *Harv. in Hook. Br. Fl.* vol. ii. p. 358. *Man.* p. 138.

*Wyatt. Alg. Danm. no.* 194.

HAB. In the sea, on rocks, or, more frequently, on the larger Fuci. Frequent on the shores of the British Islands.

GEOGR. DISTR. Northern Atlantic shores of Europe. Baltic sea.

DESC. *Tufts* 1-2 inches in diameter, globose, made up of innumerable slender entangled filaments radiating from a centre. Filaments stoloniferous below, or sending out, here and there, irregular root-like imperfectly jointed processes; branches few, straight and erect. Joints of the lower part of the filament short, once or twice as long as broad; those of the upper branches very long. When dried on paper, to which it adheres more or less closely, it is wholly without gloss, and faded to a whitish green, except round the circumference where it usually retains a glaucous or verdigris colour. The endochrome is very fluid and not well preserved in drying.

This plant is found in abundance on most of the Atlantic shores of Europe, inhabiting the old stems of *Fucus serratus* and *F. vesiculosus*, the leaves of *Zostera marina*, and occasionally, but far less frequently, growing on submarine rocks and stones. It is decidedly found in greater perfection and abundance as we proceed northwards, and on the west coast of Scotland the finest specimens we have seen are gathered. From one of these, collected by the late Capt. Carmichael, our figure is taken.

Dr. Roth first described his *Conferva lanosa* in the third part of his 'Catalecta Botanica,' published in 1806; and soon afterwards Mr. Dillwyn introduced it to the notice of British Botanists in the

Supplement to his work on Confervæ. It does not appear to have been noticed by earlier writers. It is very closely related to *C. arcta* and *C. uncialis*, from the former of which it differs chiefly by its smaller size and less branching filaments, and from the latter more by habit than by any very decided characters. The so-called *species* of the genus *Cladophora* ought, in many cases, to be regarded more properly as tolerably constant *forms* or varieties, than truly distinct organisms; but as similar doubts of the validity of species encumber the nomenclature of plants far higher in the system, we may the more readily tolerate them here.

The proper time has, perhaps, arrived for dismembering the old genus *Conferva*, Ag., as proposed by several continental authors and carried out in this country by Mr. Hassall in his "Fresh-water Algæ." Kützing, whose name *Cladophora* I here adopt (although in strict justice *Chloroniton*, Gaill., ought to be preserved), distributes the Agardhian Confervæ into twelve genera, six of which only concern the British Flora. Of these *Edogonium*, Link, is identical with Mr. Hassall's *Vesiculifera*, and with the still older *Tiresias*, Bory, which latter name should be adopted. *Conferva* is retained for the species with simple threads, whose fruit is imperfectly known. *Rhizogonium* is proposed for *Conf. riparia*, Ag., and its allies; while *Ægagropila*, founded on *C. ægagropila* and *Spongomorpha*, on *C. uncialis*, I include in the genus now called *Cladophora*. It would be clearly a most artificial arrangement to separate *C. uncialis* generically from *C. lanosa* and *C. arcta*.

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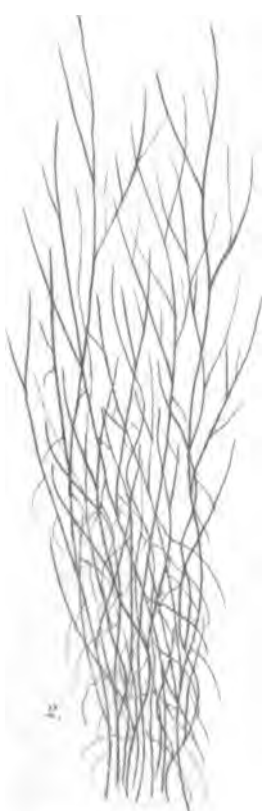
Fig. 1. CLADOPHORA LANOSA :—*natural size*. 2. Portion of a filament 3. Portion of the lower part of a filament. 4. Apex of ditto :—*magnified*.

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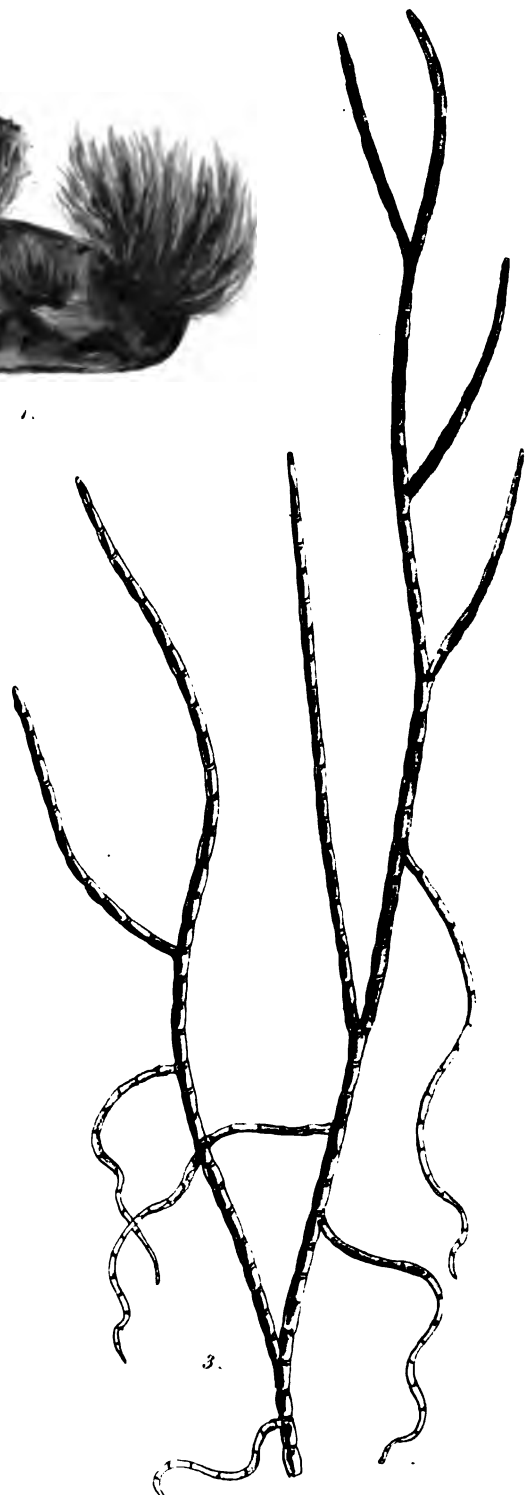




1.



2.



3.

## PLATE CCVII.

CLADOPHORA UNCIALIS, *Harv.*

GEN. CHAR. *Filaments* green, jointed, uniform, branched. *Fruit* aggregated granules or zoospores, contained in the joints, having at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*)—from *κλαδος*, a *branch*, and *φορεω*, to *bear*.

CLADOPHORA *uncialis*: tufts very short, spongy, simple below, above divided into numerous fastigiata, woolly segments; filaments flexuous, sparingly branched, densely interwoven; ramuli distant, secund, long, patent, or incurved; articulations about twice as long as broad.

SPONGIOMORPHA *uncialis*, *Kütz. Phyc. Gen.* p. 273.

CONFERVA *uncialis*, *Fl. Dan.* t. 771. fig. 1. *Lyngh. Hyd. Dan.* p. 160. t. 56. *Ag. Syst.* p. 111. *Harv. in Hook. Journ. Bot.* vol. i. p. 304. *Wyatt, Alg. Danm.* no. 146. *Harv. Man.* p. 138.

HAB. On rocks, near low water mark. Annual. May. Torbay, *Mrs. Griffiths*. Falmouth bay, *Miss Warren*. St. Michael's Mount and Aberystwith, *Mr. Ralfe*. Jersey, *Miss White*. Newcastle, Downshire, *Mr. W. Thompson*. Rathlin, Antrim, *Mr. D. Moore*. Rocks beyond Kingstown, *Miss Ball*. Malbay and Balbriggan, *W. H. H. Malahide*, *Mr. M'Calla*. Orkney, *Messrs. Thomas and M'Bain*.

GEOGR. DISTR. Shores of Northern Europe.

DESCR. *Filaments* very slender, an inch or two in length, densely aggregated into spongy or rope-like tufts, forming a more or less definite compound frond, which is simple below and divided into several branches of about equal length, whose tops, therefore, standing on a level, produce a globular tuft. As the plant advances in age, the branches become less regular, and the tufts assume a woolly or shaggy aspect. *Filaments* irregularly and distantly branched, interwoven, and connected together by root-like fibres, which issue from the sides of the branches, take a downward direction, and coil round neighbouring filaments; *branches* curved, secund, simple, or with a few erect or subpatent, simple ramuli. *Articulations* pretty uniform, generally about twice as long as broad, filled with a fluid endochrome. *Colour*, a vivid green, discharged in fresh water, and very much faded in drying. *Substance* membranaceous, adhering to paper.

This plant was added to the British Flora by Mrs. Griffiths in the year 1833, and has been found abundantly in several places. It more nearly resembles *C. lanosa* than any other of our native species, and sometimes cannot be readily distinguished without a close examination; but it forms much more dense and spongy tufts, which finally become more intricately interwoven together;

and the apices are seldom so distinctly fastigate as in that species. The habitat in which *C. uncialis* occurs, affords an additional clue. It usually frequents rocky places, growing on the rock itself, or among the thin coating of sand which covers it, in places close to the edge of low-water mark. *C. lanosa*, on the contrary, is almost always found as a parasite on other Algæ; or else attached to pieces of wood, and to the leaves of *Zostera*. To *C. arcta*, our *C. uncialis* has much resemblance; but is a much smaller plant, with very much more slender filaments.

The root-like fibres, by which the filaments are connected together, are common to the three species: and if these roots be considered a character of sufficient importance to define a *genus*, Kützing's *Spongiomorpha*, founded on the present plant, ought to include the three.

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Fig. 1. Tufts of CLADOPHORA UNCIALIS:—*of the natural size.* 2. Filaments bundled together:—*moderately magnified.* 3. Portion of a filament:—*highly magnified.*

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## PLATE CXXXV.

CLADOPHORA ARCTA, *Kütz.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit*, aggregated granules or zoospores, contained in the joints, having at some period a proper ciliary motion. CLADOPHORA (*Kütz.*),—from κλάδος, a *branch*, and φέρω, to *bear*.

CLADOPHORA *arcta*; filaments forming broad, starry tufts, of a brilliant green colour, much branched, and more or less matted together below; branches straight, crowded, very erect; ramuli appressed, opposite or alternate, scattered; articulations in the older parts once or twice as long as broad, in the young (upper) branches many times longer.

CLADOPHORA *arcta*, *Kütz. Phyc. Gen.* p. 263.

CLADOPHORA *vaucheriaformis*, *Kütz. l. c.* p. 263.

CLADOPHORA *centralis*, *Kütz. l. c.* p. 269.

CONFERVA *arcta*, *Dillw. Conf. Suppl.* p. 67. t. E. *E. Bot.* t. 2098. *Lyngb. Hyd. Dan.* p. 157. *Ag. Syst.* p. 118. *Harv. in Hook. Br. Fl.* vol. ii. p. 359. *Harv. in Mack. Fl. Hib.* part 3. p. 230. *Harv. Man.* p. 139.

CONFERVA *centralis*, *Lyngb. Hyd. Dan.* p. 161. t. 56. *Ag. Syst.* p. 111. *Fl. Dan.* t. 1777. *Harv. in Hook. Br. Fl.* vol. ii. p. 358.

CONFERVA *vaucheriaformis*, *Ag. Syst.* p. 118.

HAB. On exposed sub-marine rocks from half-tide level to low-water mark. Perennial? Spring, summer and autumn. Frequent on the British shores from Orkney to Cornwall.

GEOG. DISTR. Abundant on the Atlantic shores of Europe and north America. Baltic Sea. Falkland Islands, *Dr. Hooker*.

DESCR. *Tufts* rising from a spongy, cushion-like base, spreading in a circle, more or less split, in a starry manner, into several minor bundles, which are either simple or divided in a fan-like or palmate manner above. *Filaments* slender, flaccid, much branched, their lower portions more or less matted together according to age, connected by irregular, root-like fibres, which issue from the lower branches, and twine among the neighbouring filaments; branches very straight, and erect, somewhat pinnate, repeatedly divided, the lesser divisions alternate, or scattered, all very straight and erect. In young specimens, and also in those of the second season, after the new growth commences, the uppermost branches are much produced, of a very vivid green colour, and distinguished by having very long joints; at a later period these disappear, and the tufts become fastigate, and very matted together, like a sponge. *Colour* a rich, deep green, occasionally somewhat glaucous, fading and losing much of its gloss in the herbarium. *Substance*, when young, tender and flaccid, closely adhering to paper; when old, more or less membranaceous, and very imperfectly adhering to paper.

This species has a very different aspect at different periods of its growth, and it is not without a careful examination, and watching the plant as it progresses from its infant state till it reaches maturity and gradually passes off into old age and decay, that it can be fully understood. Without such examination, I should not have ventured to unite the three synonymes here brought together, which are regarded by continental authors as distinct species; and one of which, *C. centralis*, is by Kützing considered so widely separated from the others, as to be placed in a different section of the genus. The state called *centralis*, which the lower figure in our plate may be taken to represent, does indeed differ widely in aspect from the original *arcta*, described by Dillwyn, and formerly I considered it sufficiently distinct. But a more familiar acquaintance with the plant, aided by observations made at different periods of its growth, both by Mrs. Griffiths and myself, have fully convinced me that its characters entirely depend on age, and that it is merely the fully developed state of the species. *C. vaucheriaeformis*, on the other hand, is the youngest stage of growth.

*Cladophora arcta* abounds on all our rocky shores, and appears to be equally common throughout the Northern Atlantic. Dr. Hooker also collected it in abundance at the Falkland Islands, and very probably it is distributed as abundantly in all southern latitudes with a similar climate. I believe that it always grows upon rocks, within the range of the tide, but nearly at the limit of low water, and in such places it frequently covers a considerable surface. When young, its colour is peculiarly vivid, and its aspect silky; but as it progresses, the bright colour is more and more confined to the top branches, and the lower part of the frond becomes coarse and woolly.

The species most nearly allied to *C. arcta*, are *C. uncialis*, and *C. lanosa*, both of which are of much smaller size.

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Fig. 1. CLADOPHORA ARCTA; in a young state. 2. The same, later in the season:—both of the natural size. 3. Portion of a filament. 4. Apex. 5. Joints from the lower part of a filament:—all more or less magnified.

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## PLATE CXCVI.

CLADOPHORA GLAUDESCENS, *Griff.*

GEN. CHAR. *Filaments* green, jointed, uniform, branched. *Fruit*, aggregated granules or zoospores, contained in the joints, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*),—from *κλαδος*, a *branch*, and *φορέω*, to bear.

CLADOPHORA *glaucescens*; tufts dense, glaucous-green, subfastigate; filaments very slender, flexuous, excessively branched; branches rather straight, erect, or erecto-patent, the lesser ones furnished with close, very erect, straight, elongated ramuli; articulations nearly uniform, about thrice as long as broad.

CONFERVA *glaucescens*, *Griff. in Wyatt, Alg. Danm.* no. 195. *Harv. Man.* p. 139.

HAB. On rocks and stones, between tide marks. Annual. Summer. Not uncommon. Torquay, *Mrs. Wyatt*. Falmouth Bay, *Miss Warren*. Mounts Bay, *Mr. Raife*. Mangan's Bay, *Miss Ball*. Portmarnock, *Mr. Moore*. Coast of Down, *Mr. W. Thompson*. Rocks beyond Kingstown Harbour, abundant in May, *W. H. H.*

GEOG. DISTR. British Islands.

DESCR. *Root*, a small callus. *Filaments* very slender, densely tufted, two to four inches long, sometimes forming circumscribed tufts, sometimes more unequally distributed, excessively branched; the principal branches variously curved or irregularly bent, the lesser ones more and more straight and erect, alternate, or secund, very rarely opposite, repeatedly divided. *Ultimate ramuli* usually elongated, consisting of several cells, secund, erect, close together. *Articulations* uniform in all parts of the frond, about thrice as long as broad, filled with a pale green, not very dense endochrome, which is more or less dissipated in drying. *Substance* membranaceous, rather soft, but not flaccid, adhering, but not very closely, to paper in drying. When dry, the colour is sometimes a pale green, sometimes darker; and the filaments preserve a slight gloss.

This is one of the many beautiful plants for whose correct determination the Phycologist is indebted to the accurate eye and discriminating judgment of Mrs. Griffiths, who first published it in Mrs. Wyatt's excellent Fasciculi of Devonshire Algæ. It is difficult to say to which of the British species of *Cladophora* it is most closely allied. At one time I regarded it as belonging to the same group as *C. arcta*, and even thought that it might prove to be merely a state of that species: but a more careful examin-

ation and comparison show a greater affinity with *C. albida* or *C. refracta*, from either of which, however, it is readily known by a difference in ramification. Its peculiarly glaucous colour when fresh, joined to the slenderness of the filaments, and the uniform length of the articulations in all parts of the stem, are characters by which it may most easily be known. To avoid mistakes, I have drawn the magnified portions (fig. 2 and 3) from part of one of the original specimens published in the *Algæ Danmonienses*. It sometimes grows to a much larger size than is represented at fig. 1.

I am not aware that this species has yet been noticed beyond the range of Britain; but the various forms of this puzzling genus are so imperfectly deciphered, that it is quite possible that it may be found under some other name, among the long lists of species published by various Continental authors. But this is a point which can scarcely be settled without a careful comparison of authentic specimens in various states. Meanwhile, I trust the figure and description now given will serve to make the characters of our *C. glaucescens* more generally known to botanists out of England.

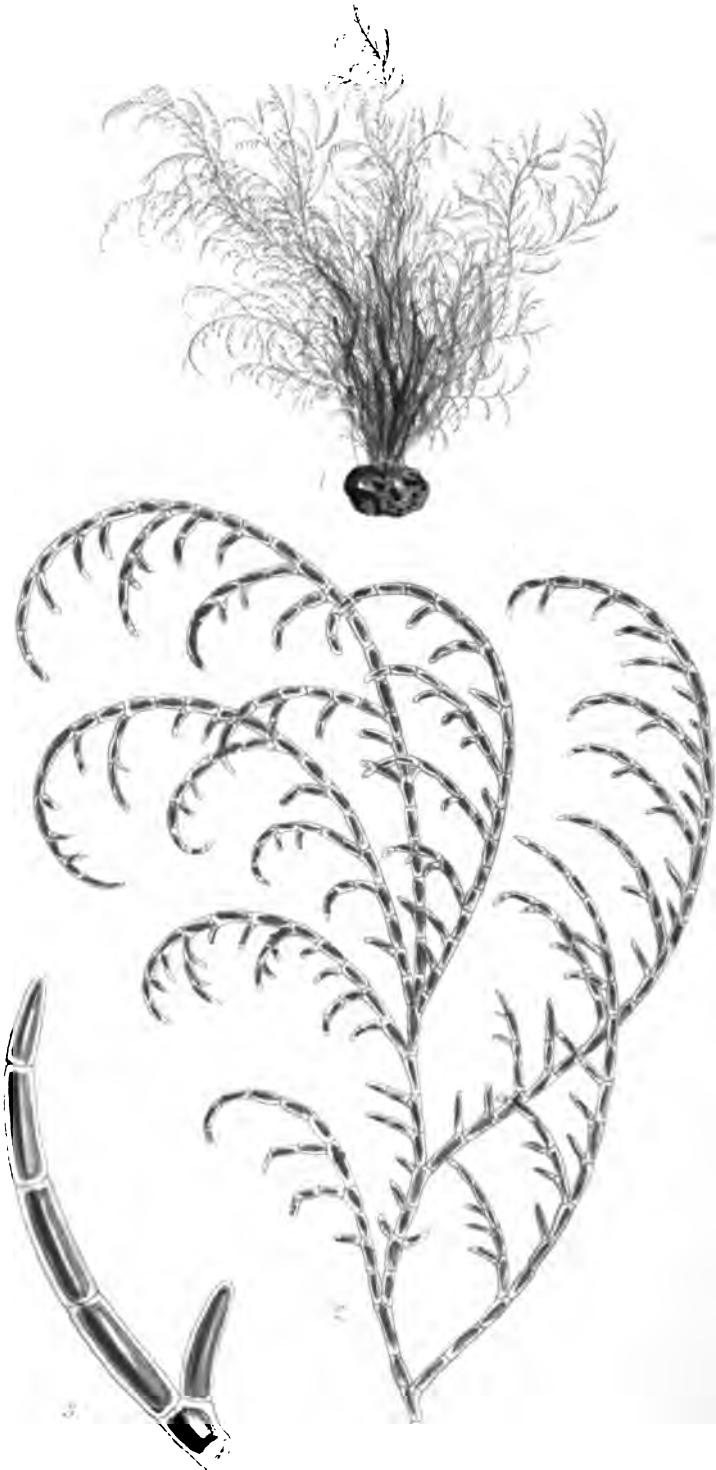
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Fig. 1. *CLADOPHORA GLAUDESCENS*:—of the natural size. 2. Part of a branch.  
3. Ramuli:—more or less highly magnified.

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## PLATE CCXVI.

CLADOPHORA FALCATA, *Harv.*

GEN. CHAR. *Filaments* green, jointed, uniform, branched, *Fruit*, aggregated granules or zoospores, contained in the joints, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*),—from *κλαδος*, a *branch*, and *φορεω*, to *bear*.

CLADOPHORA *falcata*; densely tufted, dark-green; filaments intricate at the base, ultra-capillary, rigid, much curved, irregularly branched; branches zig-zag, repeatedly divided, the lesser divisions arched, or strongly incurved and falcate, furnished along their inner faces with short, secund, blunt ramuli; articulations three or four times longer than broad, with a dense endochrome, and pellucid dissepiments.

CLADOPHORA *falcata*, *Harv. in Herb.—Phy. Brit.* vol. i. p. 14.

HAB. The bottoms of clear rock-pools, near low-water mark. Annual. Summer. Rocks outside Dingle Harbour, Kerry, *W. H. H.* (1845). Jersey, *Miss White*.

GEOGR. DISTR. British Islands.

DESCR. *Filaments* densely tufted, somewhat interwoven and entangled at the base, three or four inches high, thicker than human hair, nearly of equal diameter throughout, much branched and repeatedly divided. *Branches* curved and twisted, or curled in various directions, irregularly divided; the lesser branches sometimes alternate, sometimes secund, and sometimes two or three springing from the same point, all very erect, arching or strongly hooked inwards, furnished on their concave side with numerous secund ramuli of unequal length, long and short occurring alternately, the shorter ramuli simple, formed of one or two cells; the longer bearing a second series on their faces, and hooked like the branches. The aspect of the whole tuft is peculiarly crisp and squarrose. *Articulations* tolerably uniform, three or four times as long as broad, with hyaline borders and dissepiments, and containing a dense endochrome, which partially recovers its form after having been dried. *Colour*, a rich, glossy, full green. *Substance* rigid and crisp, adhering to paper in drying.

I gathered a few specimens of the *Cladophora* here figured in the summer of 1845, in some deep rock-pools, near low-water mark, under a steep mural cliff, in a situation where the fronds were constantly in shade. More recently I have received from Miss White specimens collected at Jersey, which agree in most

characters with the West of Ireland plant, but are not exactly true to the type. Beautiful, and apparently distinct, as our *C. falcata* is, I am by no means satisfied that it should be regarded as a true species. For, omitting the curled branches and the bending of the ramuli to one side, there are little or no characters to keep it separate from *C. latevirens*. I am not disposed to attach much value to the curvature of the branches, as an absolute character,—at least until the species has been longer observed; meantime, the beauty of this little plant, be it species or variety, has tempted me to bestow a figure on it.

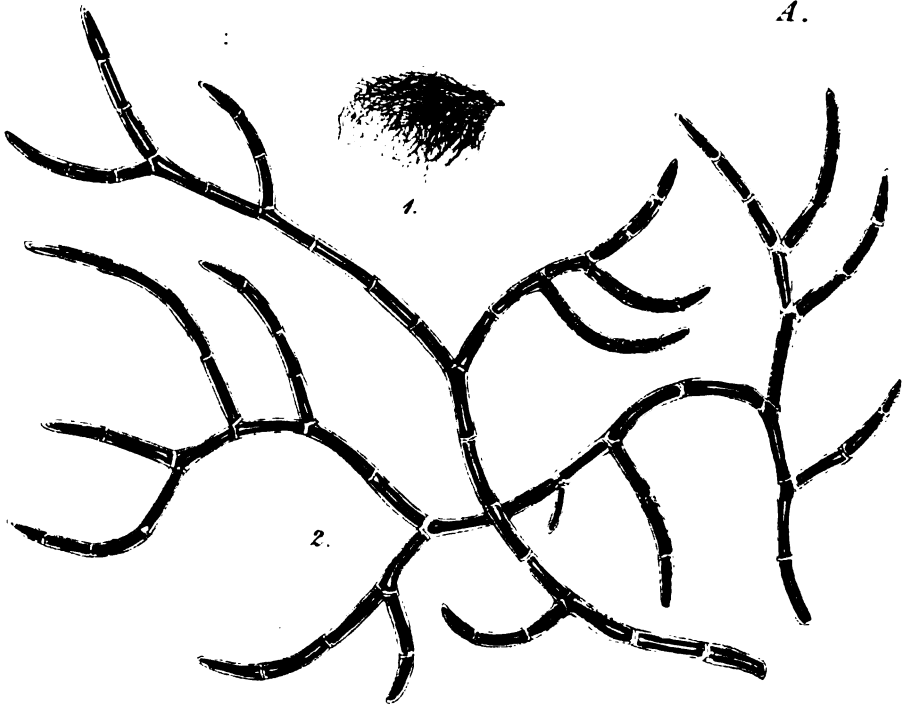
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Fig. 1. CLADOPHORA FALCATA :—*the natural size*. 2. Portion of a branch, with branchlets. 3. Articulations;—*both more or less magnified*.

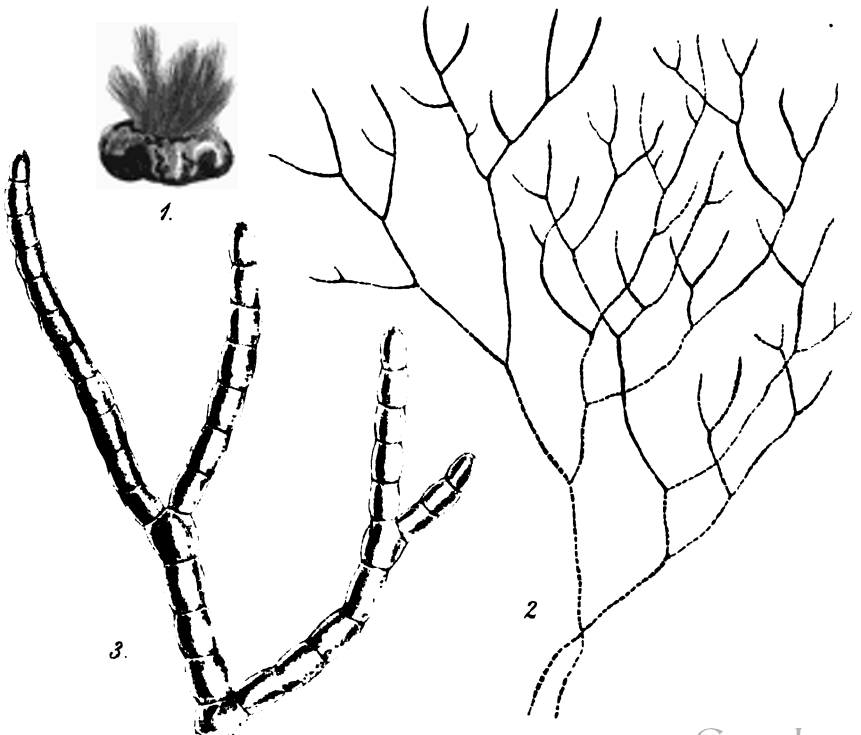
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A.



B.



## PLATE CCCLV. A.

## CLADOPHORA MAGDALENÆ, n. sp.

GEN. CHAR. *Filaments* green, attached, uniform, branched, composed of a single series of cells or articulations. *Fruit*, aggregated granules or zoospores, contained in the articulations, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*),—from *κλαδος*, a *branch*, and *φορεω*, to *bear*.

CLADOPHORA *Magdaleneæ*; filaments capillary, blackish-green, short, decumbent (?), matted together, slightly branched, irregularly bent; branches patent or divaricate, curved, dichotomous or secund, with wide axils; ramuli few, spreading, falcate, as thick as the cells from which they spring; articulations thrice or four times as long as broad, filled with very dense opaque endochrome; dissepiments very narrow, not contracted.

HAB. At Jersey, *Miss Magdalene Turner*.

DESCR. *Filaments*, in the only specimen examined, about an inch long, matted together, but not tufted, apparently growing either prostrate or entangled among the bases of other Algæ, not much branched. *Branches* irregularly dichotomous, or angularly alternate, spreading with wide angles, often divaricate, curved, simple or once or twice divided; naked, or furnished with a few secund, falcate ramuli. *Articulations* thrice or four times as long as broad, those of the ramuli the shortest, filled with a very dense, dark green, minutely granulated endochrome (resembling that of *C. rupestris*); the dissepiments very narrow and scarcely at all contracted. The apices obtuse. *Substance* somewhat rigid, not adhering to paper in drying. *Colour* a dark, dingy-green.

Not knowing to what described species to refer the apparently distinct little plant here figured, I give it a provisional name. Unlike as it is in ramification and general aspect to *C. rupestris*, the cells under the microscope strongly resemble those of that species; yet I can hardly think it next of kin to that straight-growing plant, and perhaps *C. fracta* is more nearly related.

Had it been more certainly characterized or more pleasing to the eye, I should have felt a greater pleasure in naming it from its discoverer, to whom this work is indebted for many interesting additions, and for a large proportion of whatever information it affords on the Algæ of Jersey.

A. Fig. 1. CLADOPHORA EXILIS:—the natural size. 2. Portion of filaments:—magnified.

CLADOPHORA GATTYÆ, n. sp.

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CLADOPHORA *Gattyæ*; filaments an inch long, dingy-green, capillary, matted together in dense tufts, not much branched, dichotomously divided, flexuous, with few ramuli; articulations in all parts of the frond nearly uniform, about once and half as long as broad, filled with endochrome; the dissepiments very narrow, contracted.

HAB. On rocks (?) near low-water mark. Locality uncertain, *Mrs. Gatty*.

DESCR. *Filaments* about an inch long, as thick as human hair, or somewhat thicker, matted together in dense ropy tufts, irregularly branched, somewhat dichotomous, the angles rounded; ramuli few and patent. *Articulations* very uniform, about once and half as long as broad; filled with olivaceous (?) or dull green endochrome, and separated by exceedingly narrow dissepiments. *Apices* on my specimen often broken. *Substance* membranaceous, adhering to paper.

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A puzzle, figured with the hope that it may lead to more certain information. The external habit is between that of *C. uncialis* and *Ectocarpus littoralis*, but the threads are very much more robust than in the former; and differently branched from the latter, as well as more robust. The plant is, however, much battered and water-worn, having most of its upper branches and ramuli broken off:—and I am not prepared to say whether it be not some species in a dilapidated condition, whose proper character is thus concealed, or as it were shown in caricature.

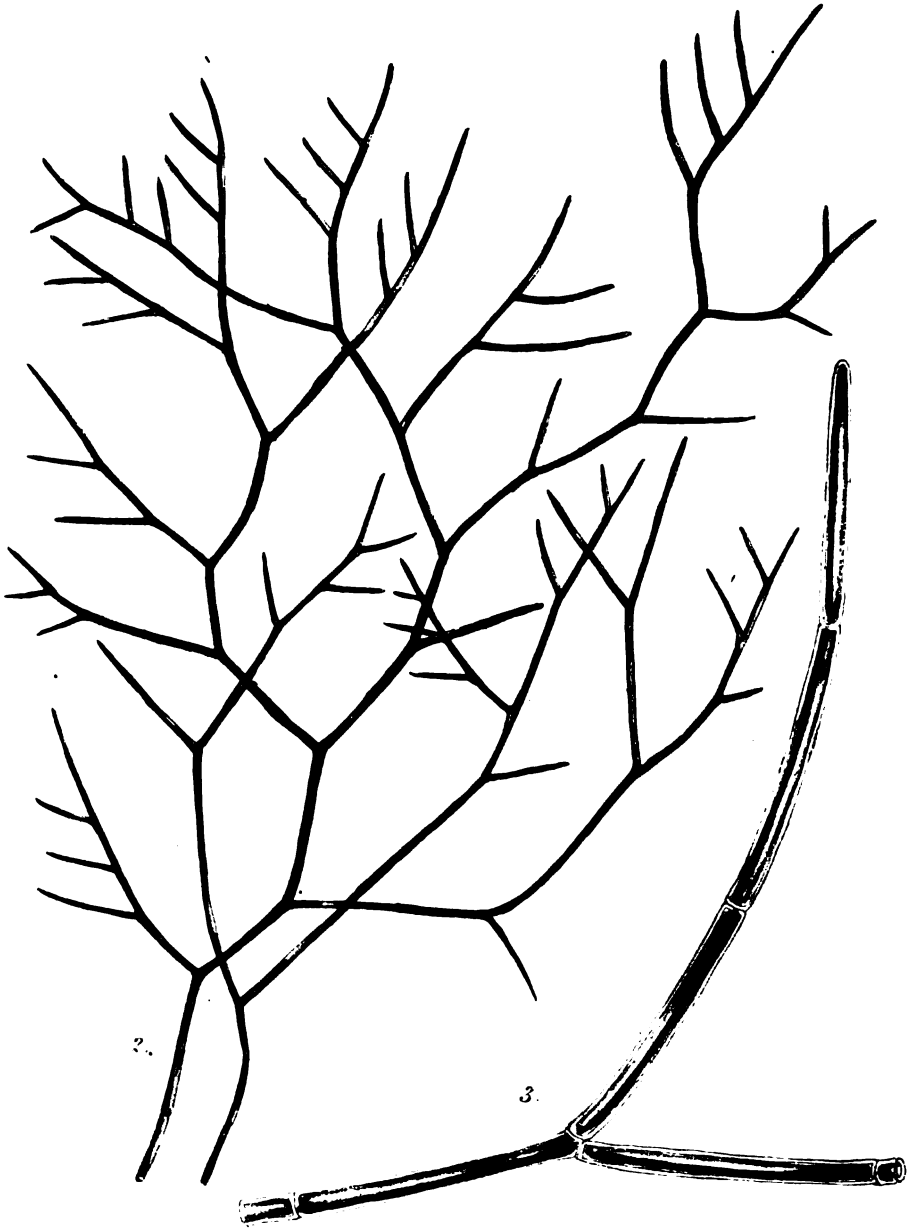
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B. Fig. 1. CLADOPHORA INAMCENA:—*the natural size*. 2. Filaments:—*magnified*. 3. Small portion of the same:—*more highly magnified*.

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## PLATE CCXCVIII.

CLADOPHORA FLAVESCENS, *Kg.*

GEN. CHAR. *Filaments* green, attached, uniform, branched, composed of a single series of cells or articulations. *Fruit*, aggregated granules or zoospores, contained in the articulations, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*),—from *κλαδος*, a *branch*, and *φορεω*, to *bear*.

CLADOPHORA *flavescens*; forming pale yellowish strata; filaments slender, sparingly branched; branches alternate or subdichotomous, erecto-patent, with scattered, elongate, alternate or secund ramuli; articulations from eight to nine times as long as broad.

CLADOPHORA *flavescens*, *Kg. Phyc. Gen.* p. 267. *Harv. Man.* ed. 2. p. 206. *Kg. Sp. Alg.* p. 402.

CONFERVA *flavescens*, *Rotk. Cat. Bot.* vol. ii. p. 224. vol. iii. p. 241. *Fl. Germ.* vol. iii. pars 1. p. 511. *Dillw. Conf.* p. 64. t. E. *E. Bot.* t. 2088. *Ag. Syst.* p. 112?

HAB. In ditches or pools of brackish or fresh water. Annual. Summer.

GEOG. DISTE. Europe.

DESCR. This species grows in continuous tufts, which, as they rise to the surface, form extensive floating strata covering the pool. *Filaments* slender, capillary, tangled together, irregularly branched; the main thread somewhat dichotomous, with widely-spreading axils, and often bent in an angular manner first to one side, then to the other: the lateral branches alternately divided, patent, with a few distant, scattered, alternate or secund ramuli. *Articulations* cylindrical, many times longer than broad, filled with a pale, granular endochrome. *Colour* when young a yellowish green, becoming yellower in age, and at last almost golden. When dry it has a silky appearance, and fades in the herbarium to a yellowish white. *Substance* soft, membranous, but not strongly adhering to paper.

In a recent number we gave a figure of *Cladophora fracta*, a species nearly related to the plant now described, and inhabiting similar places. Both species frequently fill the pools in which they grow, and, rising in the water, cover the surface with a thick fleece, under which large bubbles of air, a portion of which is oxygen disengaged by the plant under the influence of light,

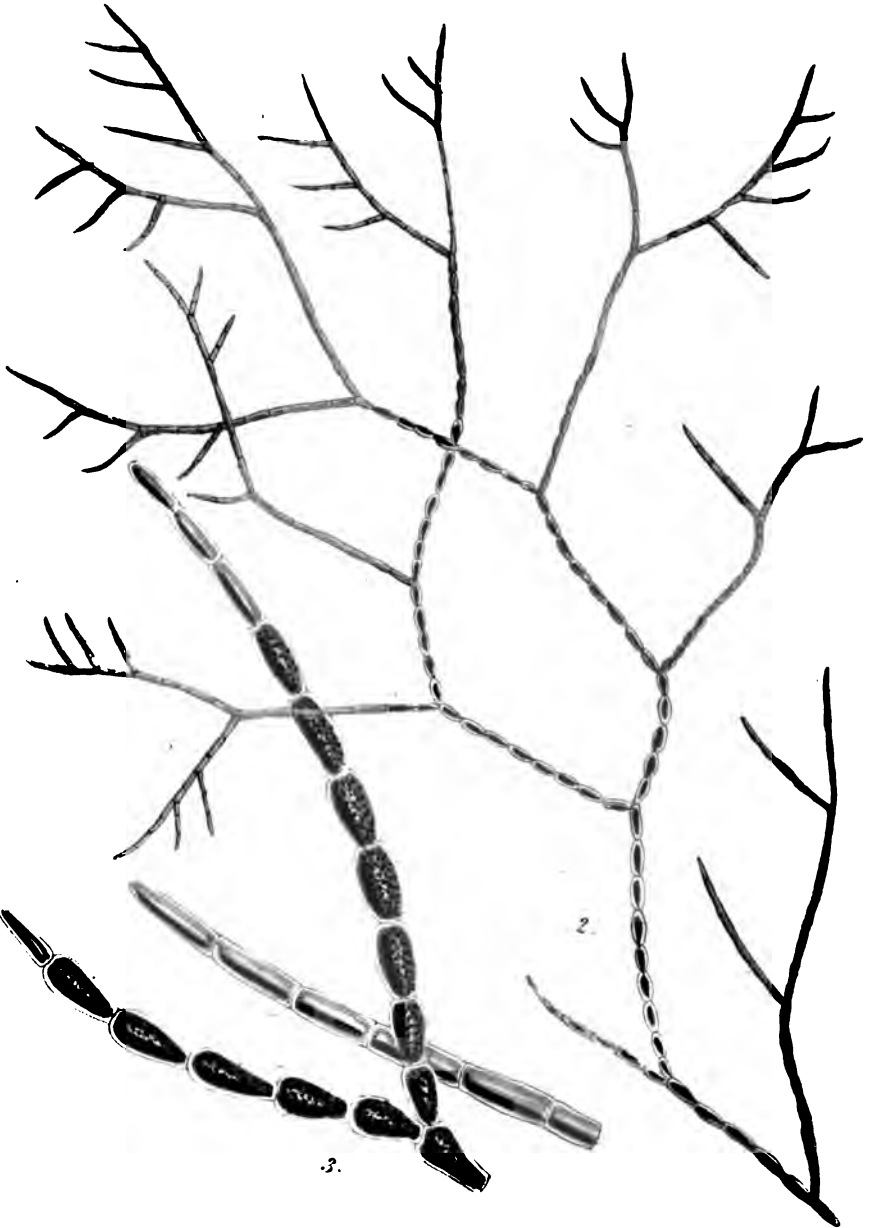
are confined. *C. flavescens*, besides its paler green colour, is readily distinguished from *C. fracta* by the much longer articulations, and their less granular contents. The specimens published under the name of *C. flavescens* in Mrs. Wyatt's fasciculi are, in my copy at least, *C. fracta*.

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Fig. 1. Tuft of CLADOPHORA FLAVESCENS:—*natural size*. 2. Portion of filaments, to show the branching. 3. Ramulus, to show the character of the articulations:—*both magnified*.

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## PLATE CCXCIV.

CLADOPHORA FRACTA, *Kg.*

GEN. CHAR. *Filaments* green, attached, uniform, branched, composed of a single series of cells or articulations. *Fruit*, aggregated granules or zoospores, contained in the articulations, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*),—from *κλαδος*, a *branch*, and *φορεω*, to *bear*.

CLADOPHORA *fracta*; tufts irregular, entangled, often detached and then forming floating strata, dull green; filaments somewhat rigid, distantly branched, the lesser branches somewhat dichotomous, spreading, with very wide axils, the ramuli few, alternate or commonly secund; articulations from three to six times as long as broad, at first cylindrical, then elliptical, with contracted dissepiments.

CLADOPHORA *fracta*, *Kütz. Phyc. Gen.* p. 263. *Kütz. Sp. Alg.* p. 410. *Harv. Man.* ed. 2. p. 206.

CONFERVA *fracta*, *Fl. Dan.* t. 946. *Dillw. Conf.* t. 14. *E. Bot.* t. 2338. *Web. et Mohr, Gr. Conf.* t. 14. *Roth, Cat. Bot.* vol. iii. p. 230. *Ag. Disp.* p. 31. *Ag. Syst.* p. 109. *Lyngb. Hyd. Dan.* p. 152. t. 52. *Harv. in Hook. Br. Fl.* vol. ii. p. 356. *Harv. Man.* ed. 1. p. 134. *Harv. in Mack. Fl. Hib.* part 3. p. 227.

CONFERVA *divaricata*, *Roth, Cat. Bot.* vol. i. p. 179.

CONFERVA *vagabunda*, *Huds. Fl. Angl.* vol. ii. p. 601. *Lightf. Fl. Scot.* vol. ii. p. 990. *Dillen. Hist. Musc.* t. 5. f. 32.

CONFERVA *hirta*, *Fl. Dan.* t. 947.

CONFERVA *flavescens*, *Wyatt, Alg. Danm.* no. 224. (*not of Roth.*)

HAB. In ditches of brackish water, communicating with the tide; also in fresh-water lakes, ditches, and streams. Common.

GEOGR. DISTR. Abundant throughout Europe.

DESCR. At first forming loose tufts, which frequently become detached, and the plant is more commonly found constituting floating strata, many tufts entangled together in each floating mass. *Filaments* capillary, from six to eight or ten inches long, much, but very irregularly branched, the branches distant, spreading at wide angles, or much divaricated, either dichotomous or alternate; the lesser branches repeatedly forked, with wide axils, and the ramuli, which are few and very patent, commonly secund, sometimes alternate. *Articulations* three or four times as long as broad, rarely six times as long, those of the upper branches pretty uniformly thrice as long as their diameter, at first cylindrical, then becoming pyriform, and when mature elliptical, when the branches resemble strings of dark-green beads. *Dissepiments* finally much contracted. *Colour* at first a pleasant grass-green, becoming darker and duller as the plant advances in age. The en-

dochrome is at first fluid, but in the full-grown articulations (which are in fact changed into *sporangia*) it becomes distinctly granular, very dense, and of a dark colour. In drying the plant adheres to paper, but not very firmly.

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The occasional occurrence of this species in salt-water ditches near the coast gives it a claim to be admitted into the present work, similar to that allowed in the cases of several other of these brackish-water plants. *C. fracta* is rarely found attached. It is more commonly met with heaped together in widely extending strata, covering the surface of the water. Sometimes in lakes, as it thus floats about, it becomes rolled together in dense balls, which have a good deal of the aspect of *C. ægagropila*, but not the same regularly radiant structure. When fully developed and in mature fruit, the middle portion of the frond is very frequently entirely converted into a string of *sporangia*, and is then a beautiful and characteristic microscopic object, which it is impossible to mistake for anything else. When not in fruit, *C. fracta* is more easily known from *C. flavescens*, which is closely allied to it, by the shorter articulations, than by any other character.

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Fig. 1. Part of a floating mass of CLADOPHORA FRACTA :—*the natural size*.  
2. Branches of the same :—*magnified*. 3. Small portions in a young and a mature state :—*highly magnified*.

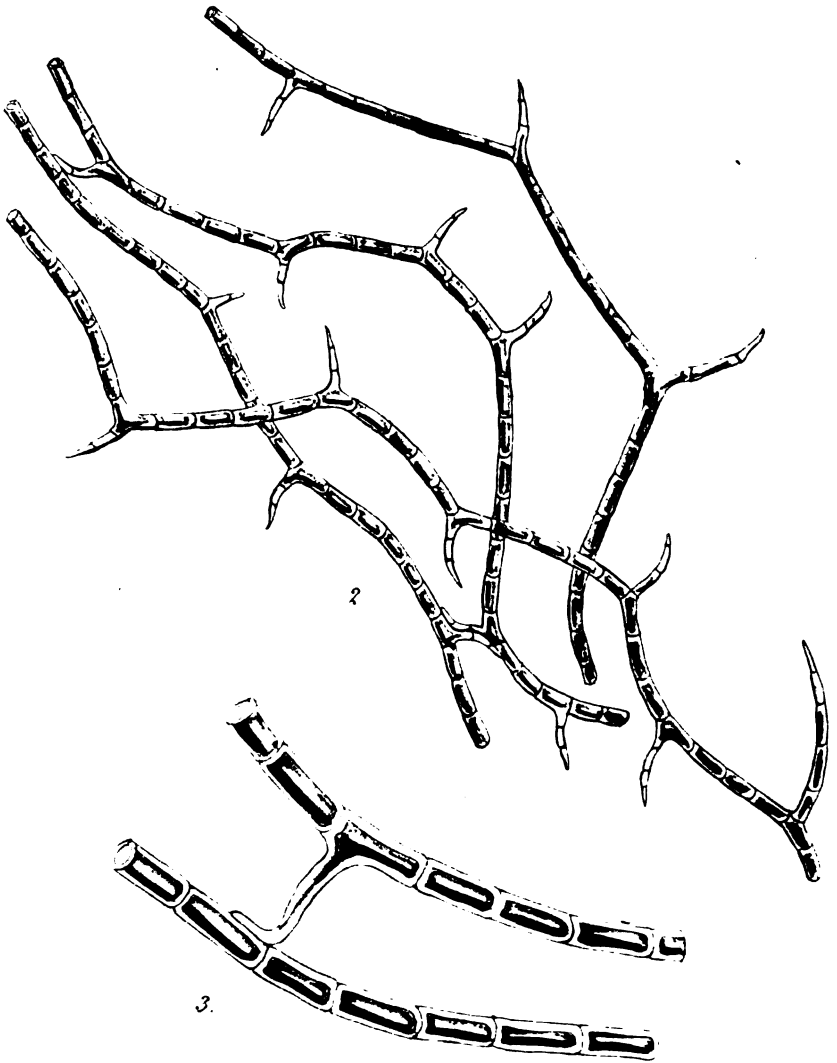
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1.



2.

3.

PLATE CCXXXVIII.

RHIZOCLONIUM \* RIPARIUM, *Kütz.*

GEN. CHAR. *Filaments* green, jointed, uniform, decumbent, simple or spuriously branched; branches short and root-like. *Fruit*, granules contained in the cells. RHIZOCLONIUM (*Kütz.*),—from *ρίζω*, to root, and *κλῶν*, a branch.

RHIZOCLONIUM *riparium*; filaments long, slender, decumbent, pale-green, forming wide strata, flaccid, entangled, angularly bent, furnished at the angles with short, root-like processes (which sometimes, but rarely, lengthen into very patent branches, and often attach themselves to neighbouring filaments.)

RHIZOCLONIUM *obtusangulum*, *Kütz. Phyc. Gen.* p. 261. (and probably *R. Jurgensii* and *R. littoreum*, *ib.*)

CONFERVA *riparia*, *Rotk Cat. Bot.* vol. iii. p. 216. *Eng. Bot.* t. 2100. *Dillw. Conf.* p. 111. *Sup. t. E. Ag. Syst.* p. 106. *Harv. in Hook. Br. Fl.* vol. ii. p. 359. *Harv. in Mack. Fl. Hib.* part 3. p. 230. *Harv. Man.* p. 140.

CONFERVA *obtusangula*, *Lyngb. Hyd. Dan.* p. 159. t. 55.

CONFERVA *perreptans*, *Carm. Harv. in Hook. Br. Fl.* vol. ii. p. 352.

CONFERVA *tortuosa*, *Wyatt, Alg. Danm.* no. 190. (not of *Dillw.*)

ZYGNEMA *littoreum*, *Lyngb. Hyd. Dan.* t. 59. (?)

HAB. On sand-covered rocks, near high-water mark. Annual. Summer. Not common. Bantry Bay, *Miss Hutchins.* Sunderland, *Mr. W. Backhouse.* Yarmouth, *Mr. Dillwyn.* Torquay, &c., *Mrs. Griffiths.* Appin, *Capt. Carmichael.*

GEOG. DISTR. Shores of Northern Europe.

DESCR. *Filaments* prostrate, forming pale green strata, sometimes spreading in patches some square feet in area, slender, lying close together, and frequently matted inextricably. The threads are angularly bent, at intervals, and from each angle issues a short, root-like tapering ramulus, usually consisting of two or three cells, standing at right, or very obtuse angles with the main filament. This rarely lengthens into a proper branch: more generally it preserves the root-like character, and attaches itself to a neighbouring filament, and sometimes two such rootlets uniting together, bind the filaments still more closely together. I have not observed the roots inosculating with the attached filament, as the connecting tubes of *Zygnema* do. *Articulations* about twice as long as broad, full of a pale-green endochrome. *Substance* flaccid, not very closely adhering to paper.

This curious little plant was first noticed as British by the

\* Misprinted *Rhizogonium* in the systematic index to the 1st volume.

late Miss Hutchins of Bantry, but notwithstanding the figures given by Dillwyn, and in English Botany, and its very distinct characters, it has been much misunderstood. The specimens published by Mrs. Wyatt, under the name *Conferva tortuosa*, belong, in the copies of her valuable work which I have examined and, I suspect, in all the others, to our *R. riparium*. It is a more slender plant than *C. tortuosa*, of a paler colour, and, above all, distinguished by the root-like fibres which issue at intervals, from the articulations; and the presence of which has induced Kützing to place it in a separate genus.

I am not certain whether all the synonyms quoted above belong to this, or to several closely allied species. According to Prof. Kützing there are three or four distinct plants confounded under the *Conferva riparia* of authors, a point to determine which I have not sufficient data at hand. As regards the specimen now figured, it is at least certain that ours is the plant of Dillwyn, our figure having been prepared from one of the original specimens collected by Miss Hutchins.

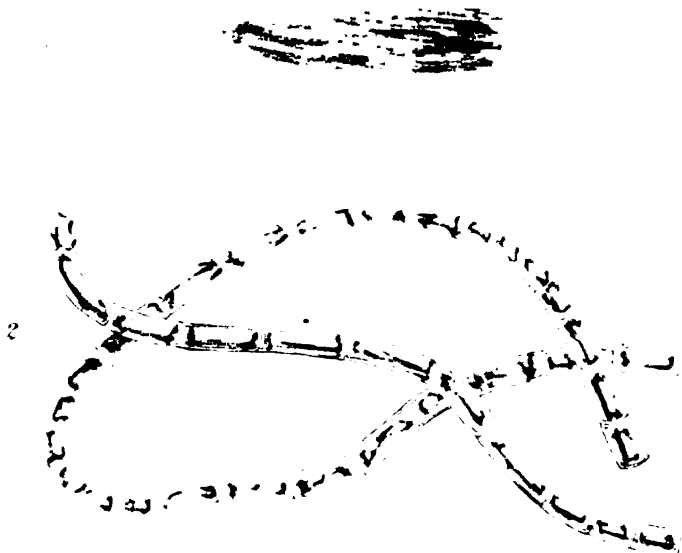
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Fig. 1. RHIZOCLONIUM RIPARIUM; stratum,—of the natural size. 2. Filaments from the same; magnified. 3. A portion:—more highly magnified.

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A.



B.

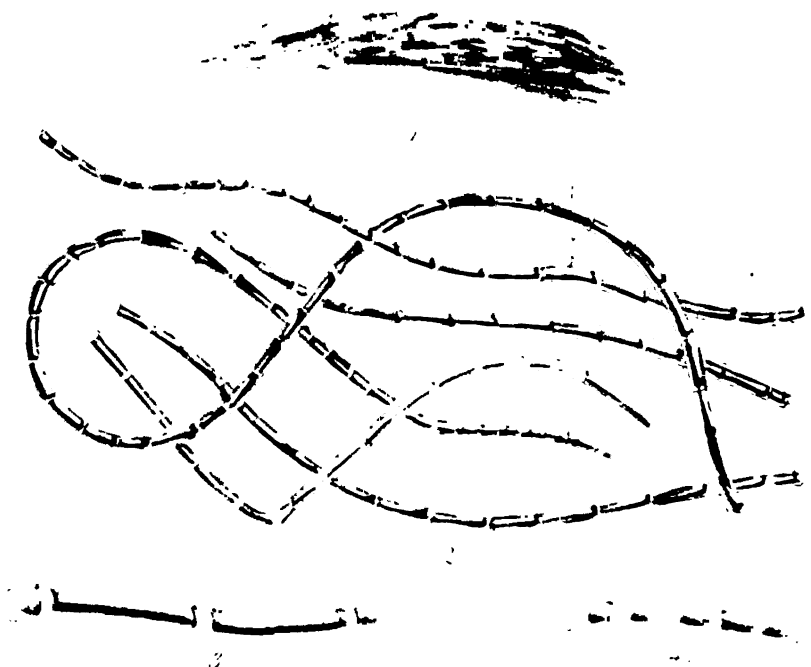


PLATE CCCLIV. A.

CONFERVA ARENICOLA, Berk.

GEN. CHAR. *Filaments* green, attached or floating, unbranched, composed of a single series of cells or articulations. *Fruit*, aggregated granules or zoospores, contained in the articulations, and having, at some period, a proper ciliary motion. CONFERVA (*Plin.*),—from *conferruminare*, to *consolidate*; because some of the species were used by the ancients for binding up fractured limbs.

CONFERVA *arenicola*; “threads soft, simple, extremely fine, matted, somewhat crisped, at first uniform pale green, at length distinctly jointed; articulations once and half as long as broad, dotted; interstices pellucid.”—*Berk.*

CONFERVA *arenicola*, *Berk. Gl. Br. Alg.* p. 36. t. 13. f. 3. *Harv. Man.* ed. 1. p. 128. ed. 2. p. 207.

HAB. Salt marshes, within reach of the tide, *Rev. M. J. Berkeley.*

DESCR. “Creeping on the sandy margins of pools in a salt marsh periodically flooded, forming a thin, soft, delicate, crisped web of a pale yellow-green. *Threads* extremely slender, flexuous, at first self-coloured with a few scattered dots, then with manifest dissepiments, and finally the granules contract and form a distinctly defined mass of a darker green in the centre, with pellucid interstices. Articulations  $1\frac{1}{2}$  as long as broad. When dry the articulations are alternately contracted.”—*Berk. l. c.*

I am indebted to Mr. Berkeley, from whose ‘Gleanings’ I copy the above account, for a loan of the original specimen from which his description was prepared. This I have used in preparing the magnified portion of the figure. Except in colour, this plant bears a close resemblance to *C. implexa*. I am not aware that it has been noticed more than once.

A. Fig. 1. Web of CONFERVA ARENICOLA, as presented to the naked eye.  
2. Filaments from the same:—*highly magnified.*

RHIZOCLONIUM CASPARYI, n. sp.

(FOR GEN. CHAR. see Plate CCXXXVIII.)

RHIZOCLONIUM *Casparyi*; filaments elongated, extremely slender, decumbent, pale yellow-green, stratified, interwoven, curved and here and there angularly bent; at the angles emitting short root-like branches, which sometimes lengthen, and are filled with endochrome; articulations 2-6 times longer than broad, with narrow dissepiments and granular endochrome.

HAB. At Falmouth and Penzance, *Dr. Robt. Caspary*.

DESCR. Forming a thin web of a bright green colour and considerable extent. *Filaments* elongate, more slender than those of *R. riparium*, gracefully curved rather than twisted, interwoven, here and there angularly bent. At the angle issues a root-like process, which sometimes consists but of a few empty cells; at other times lengthens out into a branch. *Cells* in the same fleece very various, and even in the same filament at different ages: the full-grown cell seems to be fully six times as long as its diameter; but short cells once and a half to twice as long as broad, which seem to be cells in process of development are commonly mixed with the long cells. All contain a granular endochrome, the grains of very unequal size.

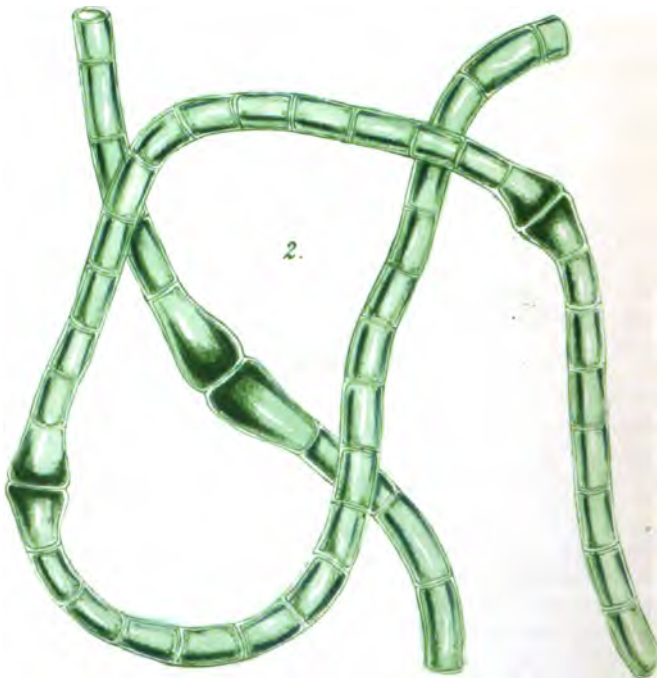
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Having a half plate to spare, I take the opportunity of figuring a *Rhizoclonium*, sent to me some months ago by Dr. Caspary, and found by him near Penzance and Falmouth. It has more slender filaments than the ordinary *R. riparium*, and occasionally appears with longer joints. But the joints vary extremely in different threads, and even in the same thread, so that I find it difficult to fix any satisfactory character by which it can be known from *R. riparium*, in the absence of ascertained specimens of that plant. The root-like branches are sometimes much more developed than is shown in the figure, which was made from less mature specimens than I afterwards received.

B. Fig. 1. Web of RHIZOCLONIUM CASPARYI, as it appears to the naked eye. 2. Filaments from the same:—*magnified*. 3, 4. Portions of different filaments, in one of which the cells have divided, in the other attained their full size.



1.



2.

PLATE CCCXXXIII.

CONFERVA LITOREA, *Harv.*

GEN. CHAR. *Filaments* green, attached or floating, unbranched, composed of a single series of cells or articulations. *Fruit*, aggregated granules or zoospores, contained in the cells, having, at some period, a proper ciliary motion. CONFERVA (*Plin.*),—from *conferruminare*, to consolidate: because some of the species were used by the ancients for binding up fractured limbs.

CONFERVA *litorea*; filaments thick, rigid, crisped, forming loose, extensive bundles of a dull green colour; articulations once and half as long as broad, here and there swollen in pairs and discoloured.

CONFERVA *litorea*, *Harv. Man. ed. 2. p. 208.*

CONFERVA *linum*, *Harv. in Hook. Br. Fl. vol. ii. p. 352. Harv. Man. ed. 1. p. 128. Wyatt, Alg. Danm. No. 220. (not of Roth.)*

HAB. In salt-water ditches near the coast; in æstuaries, and along the muddy sea-shore, between tide-marks. Annual. Summer. Appin, *Capt. Carmichael*. Plymouth, *Mrs. Wyatt*. Bangor, North Wales, *Mr. Ralfs*. Orkneys, *W.H.H.*

GEOGR. DISTR.

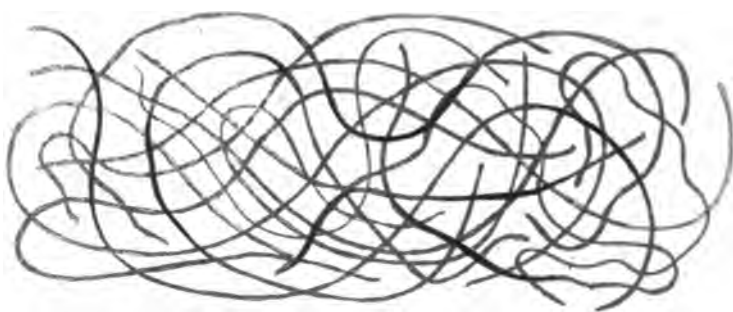
DESCR. *Filaments* three or four inches long or more, about half the diameter of *C. ærea*, loosely bundled together in prostrate or floating strata of considerable extent, and of a pale green colour, becoming darker and duller as the season advances. Each filament is irregularly curled and twisted, and sometimes angularly bent. The articulations are cylindrical, filled with a pale green watery endochrome, and about once and half as long as broad; and here and there, at irregular intervals, two proximate articulations, longer and broader than the rest, form together a spindle-shaped swelling, in which a dark-coloured endochrome collects, the mass being darkest and densest where the two cells touch each other. This looks like the commencement of fructification, but I am unable to say whether a sporangium is ultimately formed. These dark-coloured double cells are frequently so numerous that they give the filaments, when examined with a pocket lens, a variegated appearance. *Substance* membranaceous, and in drying the plant scarcely adheres to paper.

The above description is intended for the plant commonly found in British Herbaria under the name *C. linum*, Br. Fl.,

but which (as already stated under t. CL.) is very different from the plant so named by Roth ; and has, indeed, more in common with *C. tortuosa*, Dillw. I regret that I have been unable recently to compare my specimens with those found by Carmichael, and I have therefore relied for the *type* of this species on the specimens published in Mrs. Wyatt's 'Algæ Danmonienses,' as that work is in the hands of many persons. It is possible that in some collections more than one plant may be confounded under the name *linum*, Br. Fl., but I trust the figure now given will sufficiently define what I understand by that exploded species. Not having been able to identify our British specimens with any continental species, I have been forced to bestow a new name on them.

Fig. 1. CONFERVA LITOREA :—*the natural size*. 2. Portion of two filaments :—*magnified*.

A

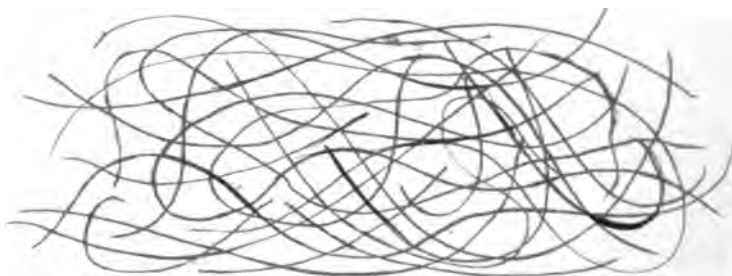


1.



2.

B



1.



2.

PLATE CL. A.

CONFERVA LINUM, *Roth.*

GEN. CHAR. *Filaments* green, jointed, attached, or floating, unbranched. *Fruit*, aggregated granules, or zoospores, contained in the joints, having, at some period, a proper ciliary motion. CONFERVA (*Plin.*)—from *conferruminare*, to *consolidate*; because some of the species were used by the ancients in cases of fractured bones.

CONFERVA *linum*; filaments very thick, of great length, light or dark green according to age, much curled, rigid, forming loosely entangled, harsh strata; articulations as long as broad.

CONFERVA *linum*, *Roth. Cat. Bot.* vol. i. p. 174. and iii. p. 257. *Fl. Dan.* p. 771. f. 2. *E. Bot.* t. 2363. *Ag. Syst.* p. 97. *Jürg.* vol. iii no. 10. *Lyngh. Hyd. Dan.* p. 147. t. 50. *Kütz. Phyc. Gen.* p. 260. (*not of Hook. Br. Fl. or Harv. Man.*)

CONFERVA *capillaris*, *Huds. Fl. Ang.* p. 598. *Lightf. Fl. Scot.* p. 988. *Dillw. Conf.* t. 9.

CONFERVA *crassa*, *Ag. Syst.* p. 99. *Harv. in Hook. Br. Fl.* vol. ii. p. 352. *Harv. in Mack. Fl. Hib.* vol. iii. p. 225. *Harv. Man.* p. 129. *Kütz. Phyc. Gen.* p. 260.

HAB. In salt-water ditches, near the coast.

GEOGR. DISTR. Shores of Europe.

DESCR. *Filaments* from a few inches to several feet in length, twice as thick as hog's bristle, very much curled, rigid, crisp and brittle, soon becoming flaccid if exposed in the air; lying in thick, but not dense, bundles of considerable breadth, disposed in strata, one above the other. *Articulations* about as long as broad, filled with granular fluid, which in some joints is more dense than in others. Eventually the joints divide in the centre by a transverse line, and the mass separates; a new diaphragm is then gradually formed, and finally a new joint. This species varies much in colour, being sometimes of a pale, at other times a dark green, and is very often mottled with dark and light green. *Substance* rigid-membranous, scarcely adhering to paper in drying.

The plant now figured is what, in British works, is usually called *C. crassa*, a name which originated with Agardh, who regarded the *Conf. capillaris* of Dillwyn, (*Conf. linum* of *E. Bot.*) as being different specifically from the original *C. linum* of *Fl. Dan.*, and founded a new species upon it. I rather hastily adopted his view in the *Br. Flora*; and still more incorrectly I took up, from the 'Algæ Appinenses' of Carmichael, another species under the name of *C. linum*, which is quite unlike the plant so called by Roth. That species will be figured in a future number. With regard to the *C. linum* of Roth; that it is the same as our British plant commonly called *C. crassa*, was the opinion of

Roth himself, (Cat. Bot. vol. iii. p. 257.) and is mine, after having examined a fragment of the specimen, published by Jurgens, and referred to by Agardh, for which I am indebted to the kindness of Mr. Berkeley. On placing together under the microscope specimens of *C. linum* from several localities, there may be observed minor differences between them, but all have so many characters in common, that I consider it quite inexpedient to propose more than one species. The *C. linum* of Jurgens is exceedingly like our British plant, and the slight difference may be accounted for by difference of habitat.

A. CONFERVA LINUM :—of the natural size. 2. Portion of a filament :—magnified.

PLATE CL. B.
CONFERVA SUTORIA, Berk.

CONFERVA sutoria; filaments setaceous, extremely long, flexuous, equal, dark green; articulations once and a half as long as broad; interstices pellucid.

CONFERVA sutoria, Berk. *Gl. Alg.* t. 14. f. 3. *Harv. Man.* p. 128.

HAB. Floating in ditches and pools, subject to the influence of the tide, at Wisbeach, *Rev. M. J. Berkeley*. Penzance, *Mr. Ralfs*.

GEOGR. DISTR. England.

DESCR. *Filaments* several inches to a foot or more in length, as thick as hog's bristle, variously curved and twisted, forming extensive loosely packed bundles or strata, which fill the pools in which they grow. *Articulations* once and a half as long as broad, filled with a dark green fluid, at length separating by a transverse medial line into two portions, which eventually become separate joints. *Colour* dark green, not variegated. *Substance* rigid, not adhering to paper in drying.

I have been favoured by the Rev. M. J. Berkeley with a portion of the specimen which he figured in the 'Gleanings,' when founding the present species; and it so nearly resembles a plant which I have received from Mr. Ralfs, that I have ventured to consider both as belonging to one species; but, to prevent mistakes, I may remark that the figure now given has been taken from Mr. Ralfs' specimen. The general habit of the plant is very similar indeed to that of *C. linum*, mixed with which Mr. Berkeley found it growing; it forms similar loosely bundled masses; but the diameter of the filament is less, and the joints are proportionably longer.

B. Fig. 1 CONFERVA SUTORIA :—natural size. 2. Portion of a filament :—magnified.



A.



B.



C.

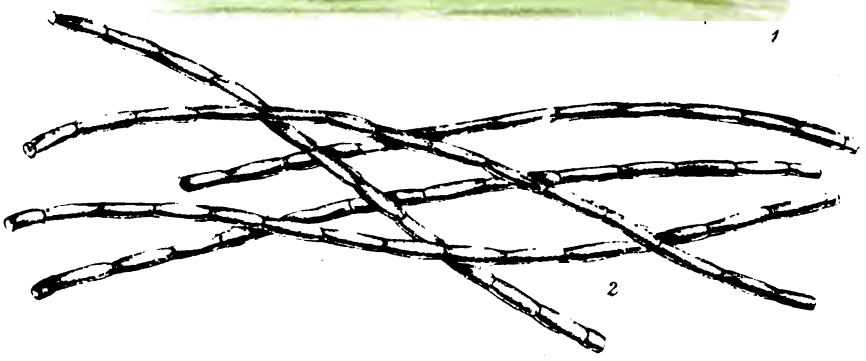


PLATE LIV. A.

CONFERVA TORTUOSA, *Dillw.*

GEN. CHAR. *Filaments* green, jointed, unattached, forming stratified bundles, unbranched. *Fruit* aggregated granules or zoospores, contained in the joints, having at some period, a proper ciliary motion. CONFERVA (*Plin.*)—from *conferruminare*, to *consolidate*; because some of the species were used by the ancients in cases of fractured bones.

CONFERVA *tortuosa*; filaments rigid, slender, much curled and twisted, forming broad closely interwoven strata; articulations twice or thrice as long as broad.

CONFERVA *tortuosa*, *Dillw. Conf. t. 46. E. Bot. t. 2220. Lyngb. Hyd. Dan. p. 145. t. 49. Grev. Fl. Edin. p. 315. Ag. Syst. p. 98. Harv. in Hook. Br. Fl. vol. ii. p. 352. Harv. in Mack. Fl. Hüb. part 3. p. 225. Harv. Man. p. 129. (excl. var. β.) J. Ag. Alg. Medit. p. 12.*

HAB. On submarine rocks, at half-tide level; also in salt pools by the edge of the sea. Salt pools by the Yare, and on marine rocks at Swansea, *Mr. Dillwyn.* Frith of Forth, *Messrs. Arnott and Greville.* Miltown Malbay, and Skerries, *W. H. H.* Not uncommon.

GEOG. DISTR. Shores of Europe. Færoe Islands. Mediterranean Sea.

DESCR. *Filaments* forming crisped strata from a few inches to several feet in diameter, which closely adhere to the inequalities of the rock, or to the plants that grow on it. The mass is of a brilliant green, and glossy. The joints are somewhat variable in length, and generally contain a mass of dense endochrome, which is well preserved in drying, and recovers its form on being moistened.

The plant published in Wyatt's 'Algæ Danmoniensis' under this name belongs, if I mistake not, rather to *C. riparia*, Roth, to which also, perhaps, the *C. perreptans* of Carmichael ought to be referred.

A. Fig. 1. CONFERVA TORTUOSA:—*natural size.* 2. Some of the filaments *magnified.*

PLATE LIV. B.

CONFERVA IMPLEXA, *Dillw.*

CONFERVA *implexa*; filaments very slender, rather flaccid, forming extensive, much entangled, bright-green strata; articulations about as long as, or longer than, broad.

CONFERVA *implexa*, *Dillw. Suppl. t. B. E. Bot. t. 2309. Lyngb. p. 144. t. 49. Ag. Syst. p. 91. Harv. in Hook. Br. Fl. vol. ii. p. 352. Harv. in Mack. Fl. Hüb. part 3. p. 226. Harv. Man. p. 129. Wyatt, Alg. Danm. no. 142.*

CONFERVA *ulothrix*, *Lyngb? Hyd. p. 146. t. 50. Harv! l. c. p. 353. Harv! Man. p. 129.*

CONFERVA intricata, *Grev! Fl. Edin.* p. 315.

BANGIA Johnstoni, *Grev! in Johnst. Fl. Berw.* p. 260.

BANGIA viridis, *Fl. Dan.* t. 1601. f. 1. (*sec. Lyngb.*)

HAB. On marine rocks, and attached to Algæ. Bantry Bay, *Miss Hutchins.*
Berwick, *Dr. Johnson.* Frith of Forth, *Dr. Greville.* Torquay, *Mrs.*
Griffiths. Malbay, *W. H. H.* Not uncommon.

GEOGR. DISTR. Shores of Europe. Færoe Islands.

DESCR. *Filaments* about two thirds the thickness of those of *C. tortuosa*, forming densely interwoven strata, or tufts among the branches of other Algæ. *Joints* even in the same thread varying from a little shorter than their breadth, to about once and a half as long. *Colour* a dark grass green.

I am now of opinion that the plant called *C. ulothrix* in the British Flora, whether the species intended by Lyngbye or not—a point which I do not determine—cannot be kept separate from *C. implexa*. This species was first noticed by the late Miss Hutchins, at Bantry, and is probably widely dispersed.

B. Fig. 1. CONFERVA IMPLEXA:—*natural size.* 2. some of the threads *magnified.*

PLATE LIV. C.

CONFERVA ARENOSA, *Carm.*

CONFERVA arenosa; filaments slender, straightish, rigid, forming broad strata; articulations from three to five times longer than broad.

CONFERVA arenosa, *Carm. Alg. Appin. ined.* *Harv. in Hook. Br. Fl.* vol. ii. p. 353. *Harv. in Mack. Fl. Hib.* part. 3. p. 226. *Harv. Man.* p. 130.

HAB. On the sandy sea-shore, at half-tide level. Appin, *Capt. Carmichael.* Bantry Bay. *Mr. R. Ball.*

GEOGR. DISTR. Scotland. Ireland.

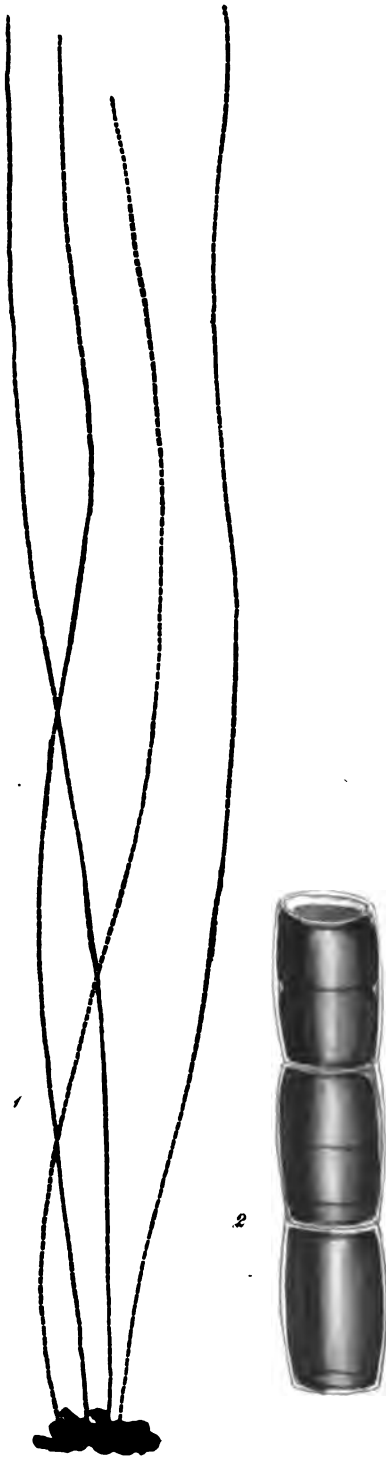
DESCR. "This species," says Capt. Carmichael, "occurs in fleeces a yard or more in extent, and of a peculiar structure. They consist of several exceedingly thin layers, placed over each other, but so slightly connected that they may be separated like folds of gauze, to the extent of many inches, without the least laceration. *Filaments* 5 or 6 inches long, about the thickness of *C. bombycina*, rigid, possessed of a peculiar roughness; feeling, when pulled asunder, as if hair were drawn over a piece of rosin. *Articulations* 3-5 times as long as broad; sporular mass assuming a great variety of forms. When old, the filaments become exceedingly rough, and often tubercular."—*Alg. Appin. ined.*

The great length of the joints readily distinguishes this species from any other British Marine Conferva.

It may be well to observe that the three species here represented are drawn to the same scale.

C. Fig. 1. CONFERVA ARENOSA:—*natural size.* 2. Some of the filaments *magnified.*

A.



B.



PLATE XCIX. A.

CONFERVA MELAGONIUM, *Web. et Mohr.*

GEN. CHAR. *Filaments* green, jointed, attached or floating, unbranched. *Fruit*, aggregated granules or zoospores, contained in the joints, having at some period, a proper ciliary motion. CONFERVA (*Plin.*)—from *conferruminare*, to *consolidate*; because some of the species were used by the ancients in cases of fractured bones.

CONFERVA *Melagonium*; root scutate, filaments elongated, robust, scattered or slightly tufted, erect, stiff and wiry, dark-green; joints twice as long as broad.

CONFERVA *Melagonium*, *Web. et Mohr. It. Succ.* p. 194. t. 3. f. 2. a, b. *Roth, Cat. Bot.* vol. iii. p. 254. *Dillw. Int.* p. 48. *Suppl. t. B. Ag. Syn.* p. 84. *Lyngb. Hyd. Dan.* p. 148. t. 51. *Ag. Syst.* p. 99. *Harv. in Hook. Br. Fl.* vol. ii. p. 354. *Harv. in Mack. Fl. Hib.* part 3. p. 226. *Harv. Man.* p. 130. *Wyatt, Alg. Danm.* no. 221. *Kütz. Phyc. Gen.* p. 260.

HAB. On the rocky bottoms of deep tide pools, near low-water mark. Perennial. Found on many parts of the British coasts, from Orkney to Cornwall, and on all the coasts of Ireland; but nowhere very abundant. Jersey, *Miss White*.

GEOGR. DISTR. Throughout the Northern and German Ocean. Iceland. Greenland. Shores of North America; Boston Bay, *Dr. A. Gray*.

DESCR. *Root* scutate. *Filaments* five to twelve inches long or more, twice or thrice as thick as hog's bristles, erect, stiff, and very tough, straight, of equal diameter throughout, rarely tufted, generally growing in a scattered manner, or in small clusters of four or five, of a very dark green colour. *Articulations*, except the basal one, which is short, about twice as long as broad, filled with a dark green mass, which at length separates into two portions. *Dissepiments* contracted, very narrow, pellucid.

This species is widely dispersed throughout the Northern Atlantic, from the shores of Greenland to those of Britain, and extends along the shores of North America, as far as Boston, and perhaps further southward. It is abundantly distinguished from all British species by the great diameter and rigidity of its filaments, which stand erect, if the water be removed from them; but it seldom grows in places where it is left exposed on the recess of the tide. Its nearest affinity is with *C. ærea*, which I have therefore represented on the same plate; but it is a much more rigid plant.

- A. Fig. 1. CONFERVA MELAGONIUM; some filaments:—of the natural size.
2. Portion of a filament:—magnified.

PLATE XCIX. B.

CONFERVA ÆREA, Dillw.

CONFERVA *ærea*; root scutate, filaments elongated, setaceous, tufted, straight, harsh, brittle, yellow-green; articulations about as long as broad.

CONFERVA *ærea*, Dillw. *Conf.* t. 80. *E. Bot.* t. 1929. *Lyngh. Hyd. Dan.* p. 147. t. 51. *Ag. Syst.* p. 100. *Harv. in Hook. Br. Fl.* vol. ii. p. 354. *Harv. in Mack. Fl. Hib.* part 3. p. 226. *Harv. Man.* p. 130. *Wyatt, Alg. Danm.* no. 191. *Mont. Canar.* p. 184. *J. Ag. Alg. Medit.* p. 12. *Kütz. Phyc. Gen.* p. 258.

CONFERVA *antennina*. *Bory, Dict. Class.* t. 4. p. 392.

HAB. On sand-covered rocks, between tide marks. Frequent in many places.

GEogr. DISTR. Found on all the Atlantic coasts of Europe; also in the Mediterranean. Canary Islands.

DESCR. *Filaments* attached by a scutate base, three to twelve inches in length, as thick as bristles, harsh to the touch, but much less rigid than *C. Melagonium*, straight, densely tufted, of a beautiful yellow-green colour, which fades, in the Herbarium, to a greenish-white. *Articulations* about as long as broad, or a little longer, their contents at length separating into two portions. *Dissepiments* slightly contracted.

This is one of the many species of *Conferva* first brought to the notice of botanists in the excellent monograph of Dillwyn, where a correct figure is given of it. It appears to be generally diffused throughout the Atlantic, extending even within the tropics. It is always a more tufted plant than *C. Melagonium*, paler in colour, of scarcely half the diameter, and, though harsh, far less rigid and quite unable to support itself when removed from the water.

-
- B. Fig. 1. CONFERVA ÆREA; a tuft:—of the natural size. 2. Portion of different filaments:—magnified.
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PLATE CCCXXVII.

CONFERVA COLLABENS, *Ag.*

GEN. CHAR. *Filaments* green, attached or floating, unbranched, composed of a single series of cells or articulations. *Fruit*, aggregated granules or zoospores, contained in the articulations, and having, at some period, a proper ciliary motion. CONFERVA (*Plin.*),—from *conferruminare*, to *consolidate*; because some of the species were used by the ancients for binding up fractured limbs.

CONFERVA *collabens*; filaments elongated, straight, tufted, very thick (but of various diameters), gelatinous and flaccid, of a splendid æruginous green colour; articulations from once to once and a half as long as broad, filled with a dense granular mass.

CONFERVA *collabens*, *Ag. Syst. Alg.* p. 102. *Harv. in Hook. Br. Fl.* vol. ii. p. 354. *Harv. Man.* ed. 1. p. 130. ed. 2. p. 209.

CONFERVA *ærea* β . *lubrica*, *Dillw. Syn.* p. 48.

HORMOTRICHUM *collabens*, *Kütz. Sp. Alg.* p. 383.

HAB. At Yarmouth, on a floating piece of deal, *Sir W. J. Hooker*. (Only once found.)

GEOGR. DISTR. German Ocean.

DESCR. *Filaments* densely tufted, three or four inches long or more, of very various diameters in the same tuft, the largest ones being twice as thick as *C. ærea* or more, the smaller not measuring one-fourth as much in diameter. *Articulations* generally somewhat longer than their diameter, filled with a brilliantly coloured, granular and dense mass of endochrome; the dissepiments much contracted, and the walls of the cells thick. *Substance* very flaccid and gelatinous, adhering most closely to paper. The colour is a peculiarly rich green, and is well preserved in drying.

Dillwyn notices this species, making it a variety of his *C. ærea*, in the following words:—“This curious variety, which was found on the Yarmouth beach by Mr.” (Sir William) “Hooker, in the spring of 1808, attached to a piece of deal, differs so extraordinarily from the common appearance of *C. ærea*, that, except under a microscope, nobody would suspect them of being the same. It grew in a very large tuft, and its filaments were remarkably soft, tender, slippery, and glossy, so as to float with

the slightest agitation of the water, and adhere closely to paper and glass in drying." To this I have only to add that the figure here given has been drawn from the original specimen, and that no one has since met with a similar one in this country. Kützing, however, states that he has received it from the north of Germany. The filaments differ from each other very extraordinarily in diameter, so that one might suppose there were half a dozen different species under the microscope together. The specific character least variable seems to be the extreme lubricity and softness.

Fig. 1. Tuft of *CONFEEVA COLLABENS*:—*the natural size*. 2. Filaments of various diameters:—*all highly (and equally) magnified*.

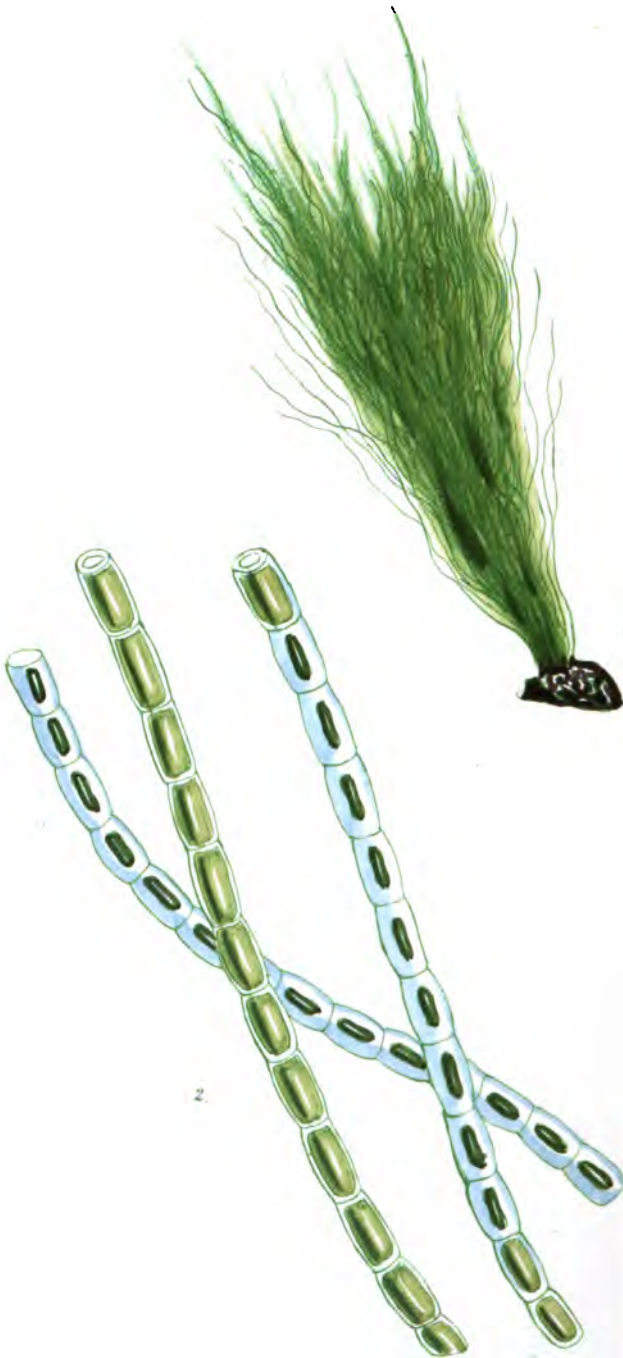


PLATE CCLXVIII.

CONFERVA BANGIOIDES, *Harv.*

GEN. CHAR. *Filaments* green, jointed, attached or floating, unbranched. *Fruit*, aggregated granules, or zoospores, contained in the articulations, having, at some period, a proper ciliary motion.—CONFERVA (*Plin.*), from *conferruminare*, to consolidate; because some of the species were used by the ancients in cases of fractured bones.

CONFERVA *bangioides*; filaments attached, elongated, very slender, soft and lubricous, wavy; articulations about twice as long as broad, containing, at maturity, a compact dark green mass; dissepiments broad, pellucid.

CONFERVA *bangioides*, *Harv. Man. Ed. 1. p. 131. Ed. 2. p.*

HORMOTRICHUM *bangioides*, *Kütz. Sp. Alg. p. 383.*

APLONEMA *bangioides*, *Hass. Fr. Alg. p. 224.*

HAB. ON rocks, &c., near low-water mark. Breakwater at Plymouth, *Mr. Blatch*. Torquay, *Mrs. Griffiths*. Port Ballantrae, *Mr. Moore*. Ballycotton, *Miss Ball*.

GEOG. DISTE. Not noticed out of Britain.

DESCR. *Filaments* from three to six inches in length, capillary, densely tufted, or spreading in large patches, which are dark green and glossy to the eye. Each filament is of equal diameter throughout, but there is much difference between the relative diameters of filaments from the same tuft. The articulations are about twice as long as broad, slightly contracted at the dissepiments, and filled with a dense herbaceous green endochrome, leaving a pellucid border all round. In an advanced stage of growth the endochrome contracts and condenses into a dark-coloured, oblong *spore*, which remains in the centre of the articulation, until, on the breaking up of a plant, it is liberated. *Substance* lubricous, closely adhering to paper in drying.

The species here figured is, in many respects, similar to *C. Youngana*, but is a larger species. From most others it may be known by its very lubricous and glossy tufts and soft feel. Except in colour there is much outward resemblance to *Bangia fuscopurpurea*, though under the microscope no two plants need be more unlike. When the plant first makes its appearance the colouring substance nearly fills the cell, and is of a pale colour, but gradually it condenses into a small, subcylindrical and dark-coloured spore in the centre.

The first specimens I received of this plant were sent to me by Mrs. Griffiths, to whom belongs the merit of having determined its characters correctly. It has subsequently been found in two stations in Ireland, but must still be regarded as one of our rarer species.

Fig. 1. Tuft of CONFEEVA BANGIODES :—*the natural size*. 2. Portions of filaments of different ages :—*highly magnified*.

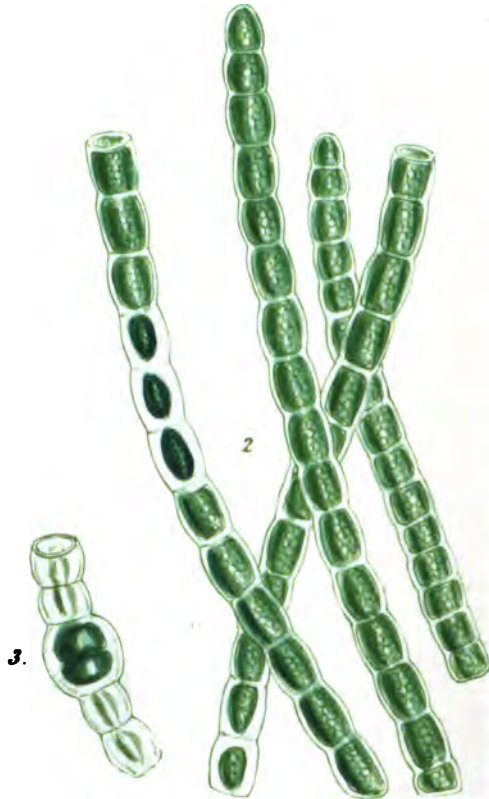


PLATE CCCXXVIII.

CONFERVA YOUNGANA, *Dillw.*

GEN. CHAR. *Filaments* green, attached or floating, unbranched, composed of a single series of cells or articulations. *Fruit*, aggregated granules or zoospores, contained in the articulations, and having, at some period, a proper ciliary motion. CONFERVA (*Plin.*),—from *conferruminare*, to *consolidate*; because some of the species were used by the ancients for binding up fractured limbs.

CONFERVA *Youngana*; filaments short, tufted, straight or nearly so, somewhat rigid; articulations once or twice as long as broad, dissepiments finally contracted.

CONFERVA *Youngana*, *Dillw. Conf.* t. 102. *Harv. in Hook. Br. Fl.* vol. ii. p. 354. *Harv. Man.* ed. 1. p. 131. ed. 2. p. 210. *Ag. Syst.* p. 101.

CONFERVA *isogona*, *E. Bot.* t. 1930.

HORMOTRICHUM *Younganum*, *Kütz. Sp. Alg.* p. 382.

HORMOTRICHUM *isogonum*, *Kütz. Sp. Alg.* p. 382.

HAB. On rocks and stones near high water-mark, on various parts of the coast. Annual. Summer. Discovered by *W. Weston Young, Esq.*, near Dunraven Castle, Glamorganshire. Yarmouth, *Sir W. J. Hooker*. Dingle Bay, Kerry, *Mr. D. Moore*.

GEOGR. DISTR. Shores of Northern Europe.

DESCR. *Filaments* from half an inch to an inch in length, erect, straight or slightly curved, obtuse, tufted, or spreading in wide shaggy fleeces over the surface of a rock. When young, the filaments are cylindrical, but they soon become contracted at the dissepiments. The cells are occasionally only as long as broad, but are usually once and half as long. The endochrome is granular and dense, filling the cell, and of a full green colour, As it becomes mature it acquires still greater density and a darker colour, and shrinks to half its size. Finally, it is changed into a bipartite sporidium lodged in a swollen and colourless cell. *Substance* membranaceous, not very soft, and having little gloss. In drying, the plant adheres, but not very closely, to paper.

To the naked eye this plant has very much the aspect of *Lynghya Carmichaelii*, with which (as I have already stated under Plate CCC.) it is properly a congener; but it is readily distinguished under the microscope, by the much longer cells,

and, especially in advanced specimens, by the contraction of the tube at the dissepiments. It bears a far closer resemblance to *C. bangioides*, but is a shorter and comparatively stouter plant, and far less lubricous. The contents of the cells also are more granular and dense.

It was originally discovered by Mr. W. Weston Young, a friend of Dillwyn's, to whom that author was indebted for the drawings from which the plates that illustrate his work on the British *Confervæ* were engraved, and to whom he has dedicated this pretty little species.

Fig. 1. Tuft of CONFERVA YOUNGANA :—*the natural size.* 2. Portions of filaments in various stages. 3. Portion of a filament with a ripe sporidium :—*both figures highly magnified.*

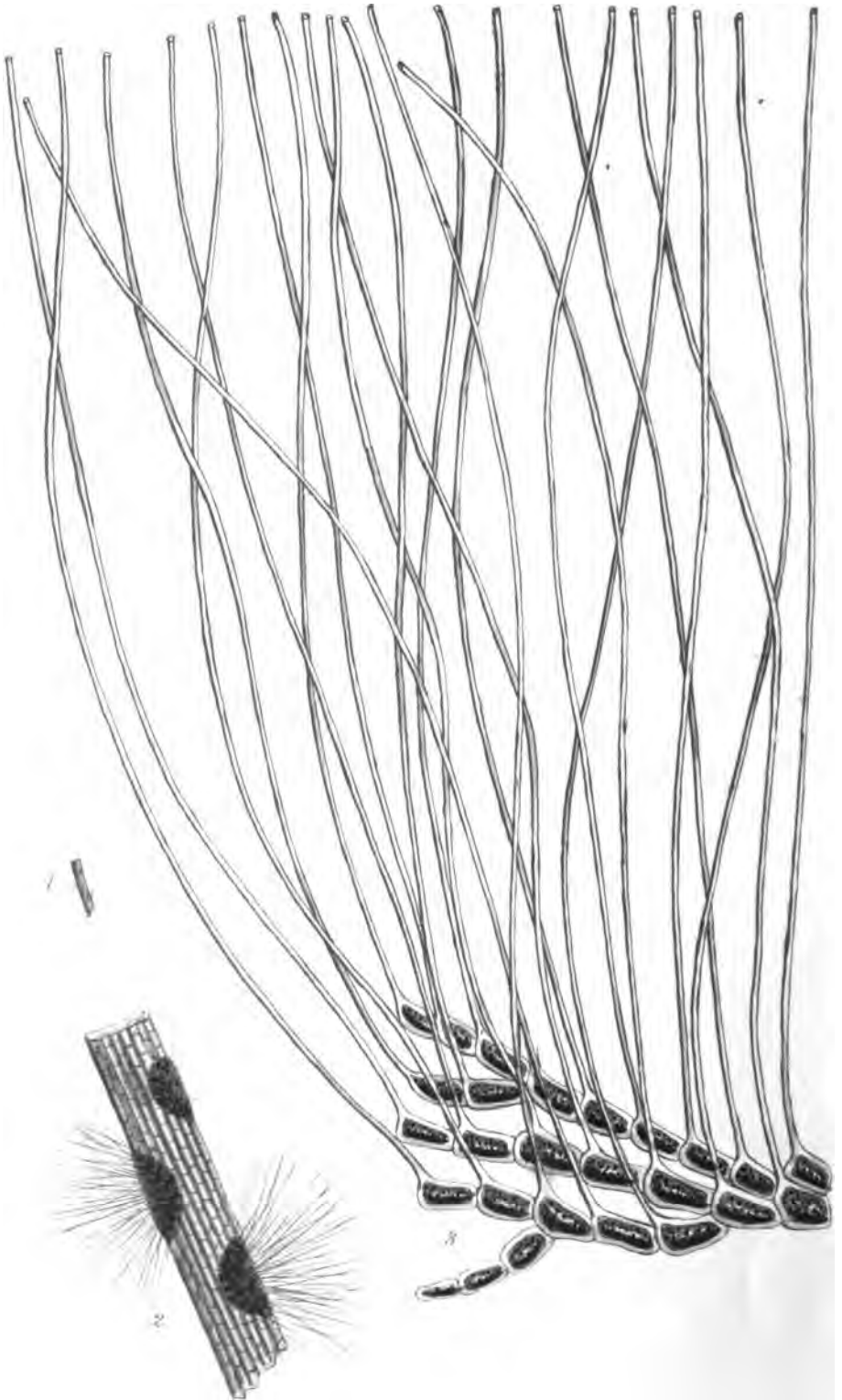


PLATE CCXXVI.

OCHLOCHÆTE HYSTRIX, *Thw. MSS.*

GEN. CHAR. *Fron*d disciform, adpressed. Filaments cylindrical, radiating from a central point, irregularly branched, consisting of a single series of cells, each of which is most commonly produced above into a rigid inarticulated seta. *Endochrome* green. *Fructification* unknown. OCHLOCHÆTE (*Thw., MSS.*)—from ὄχλος, a *multitude*, and χείρη, a *bristle*.

OCHLOCHÆTE *Hystrix*; plant very minute, pale green, hoary from its numerous rigid setæ.

HAB. On stems of grasses &c., in a lake of brackish water, called "The Little Sea," near Wareham, Dorset, *Rev. W. Smith*; also in fresh-water ditches near Bristol, upon the leaves of mosses; very rare. *G. H. K. Thwaites*.

DESCR. *Plant* disciform, frequently irregular in its outline, very minute, pale green, hoary from the multitude of rigid setæ with which it is covered. *Filaments* closely adpressed and adhering firmly to the substance on which the plant may be growing; radiating from a central point, irregularly branched, and frequently cohering laterally. *Cells* oblong, each usually furnished with a very long rigid tubular diaphanous seta. *Endochrome* granular, green. The fructification has not been observed. It is possible that the fresh-water specimens from the neighbourhood of Bristol may prove specifically distinct from the Wareham plant.

For the present we have placed *Ochlochæte* with the *Chatophoræ*, from which family, however, it will eventually have to be removed, since it differs from *Chatophora* (that is, the typical species *C. elegans*,* *Ag.*) and *Draparnaldia* in some important

* *Chatophora elegans*, *Ag.* in the state of fruit is evidently the *Gongrosira sclerococcus* of Kützing, whilst the same species with *opcospermata* appears to be the *Chatophora longæva* of Carmichael. From the inspection of an authentic specimen of *Chatophora pisiformis*, *Ag.*, kindly given to me by my friend, the *Rev. M. J. Berkeley*, I have ascertained that this species is by no means congeneric with *C. elegans*, *Ag.*, but has the fruit and setæ of *Coleochæte*, from which genus it would seem to be separated only by its erect, free, not adpressed filaments: and there can be little doubt, therefore, that *Chatophora tuberculosa*, *Ag.*, is equally allied to *Coleochæte*. *Chatophora Berkeleyi* of *Dr. Greville*, and *C. pellita*, *Lyngbye*, have already been figured in the present work under the names respectively of *Leathenia Berkeleyi*, *Harv.*, and *Ornorina pellita*, *Fries*; the former being closely allied to *Elachistea*, especially to *E. scutulata*, *Fries*; and the latter having an affinity rather with the *Nostochineæ*.—*Thwaites*.

particulars. The genera *Ochlochæte*, *Bulbochæte*, and *Coleochæte*, are very closely allied to *Tiresias*, Bory, (*Edogonium*, Link ; *Vesiculifera*, Hassall,) and bear the same relation to it that *Draparnaldia*, *Chætophora*, and *Stygeoclonium* do to the genus *Ulothrix*, of Kützing, (*Sphæroplea*, Berk., *Lynngbya*, Hassall). In the former of these two groups of plants the setæ, when present, are rigid continuous tubes ; and the fruit, so far as has been observed, is not contained within an original cell of the filament, but each *sporangium* is in a new cell, formed, it is true, by the elongation of an original cell, but subsequently separated from it by a septum : this occurs in *Tiresias*, *Bulbochæte*, and *Coleochæte*. In *Draparnaldia*, on the contrary, and its immediate allies the diaphanous prolongations of the filaments are septate, each consisting of a series of elongated cells. The *sporangia*, also, in *Draparnaldia glomerata*, Ag., and *Chætophora elegans*, Ag., in which species we have observed them, are formed within the original cells of the ramuli, causing the latter to assume a moniliform appearance. Quaternate *opseospermata*, which are most probably gemmæ, likewise occur in these species, as well as in those of the genus *Stygeoclonium* of Kützing.

[I am indebted to Mr. Thwaites for the above description, and for a beautiful figure from which our plate has been prepared.—*W.H.H.*]

Fig. 1. Fronds of OCHLOCHÆTE HYSTRIX :—*natural size*. 2. The same, *magnified*. 3. Small portion of a frond :—*very highly magnified*.

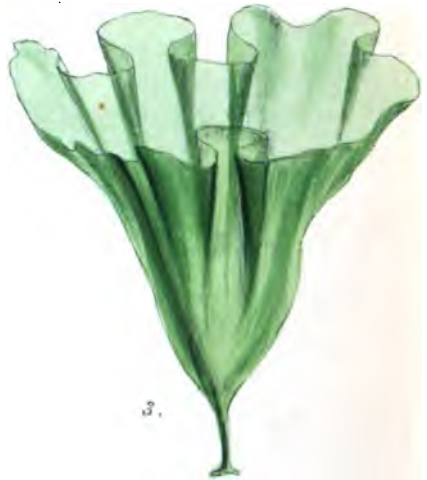


PLATE CCCIV.

ENTEROMORPHA CORNUCOPIÆ, *Hook.*

GEN. CHAR. *Fronde* tubular, membranaceous, of a green colour, and reticulated structure. *Fructification*, granules, commonly in fours, contained in the cellules of the frond. ENTEROMORPHA (*Link*),—from *εντερον*, an *entail*, and *μορφη*, *form* or *appearance*.

ENTEROMORPHA *Cornucopiæ*; gregarious, small; fronds stipitate, tubular at the base, suddenly dilated, widening upwards, plaited and lacinate at the margin.

ENTEROMORPHA *Cornucopiæ*, *Hook. Br. Fl.* vol. ii. p. 313. *Harv. Man.* ed. 2. p. 213.

SCYTOSIPHON *intestinalis*, γ . *cornucopiæ*, *Lyngb. Hyd. Dan.* p. 67.

SOLENTIA *intestinalis*, γ . *cornucopiæ*, *Ag. Syst.* p. 185.

ULVA *intestinalis*, γ . *cornucopiæ*, *Ag. Sp. Alg.* vol. i. p. 419. *Wahl. Fl. Lapp.* p. 505. *Kütz. Sp. Alg.* p. 478.

HAB. On corallines, &c., in rocky pools left by the tide. Annual. Spring and Summer. Appin, *Capt. Carmichael*. Marwick, Orkney, *Messrs. Thomas and M'Bain*.

GEOGR. DISTR. Shores of Northern Europe.

DESCR. *Root* a minute, scutate disc. *Fronde* from an inch to an inch and a half in height, with a distinct filiform stem, about a line in length, at the summit of which the tube suddenly enlarges and becomes saccate, and then gradually increases in diameter upwards. When young the frond is a closed sac; at a later period the apex bursts, the frond then becomes funnel-shaped, and jagged and plaited at the margin. *Substance* delicately membranaceous. *Structure* cellular; the cells quadrate, something larger than in *E. intestinalis*. *Colour* a pleasant grass-green.

Had not this plant been admitted to the rank of a species by the late Capt. Carmichael, than whom few naturalists have more carefully studied this variable genus, I should have been contented to regard it, with continental authors, as a dwarf variety of *E. intestinalis*. Capt. Carmichael says, "Without pushing the system of varieties to an extravagant length, this plant cannot be considered as a variety of *E. intestinalis*; the characters of the definition mark it as abundantly distinct, and to these characters it is universally constant. I look upon it,

indeed, as a much more distinct species than *E. compressa*, specimens of which occur, now and then, very difficult to be distinguished from *E. intestinalis*."—*Carm. in Hook. Br. Fl.* vol. ii. p. 313.

Fig. 1. ENTEROMORPHA CORNUCOPIÆ, fronds of various ages, growing on *Laurencia pinnatifida*:—the natural size. 2. A young, and 3, an old frond:—slightly enlarged. 4. Small portion of the membrane:—highly magnified.

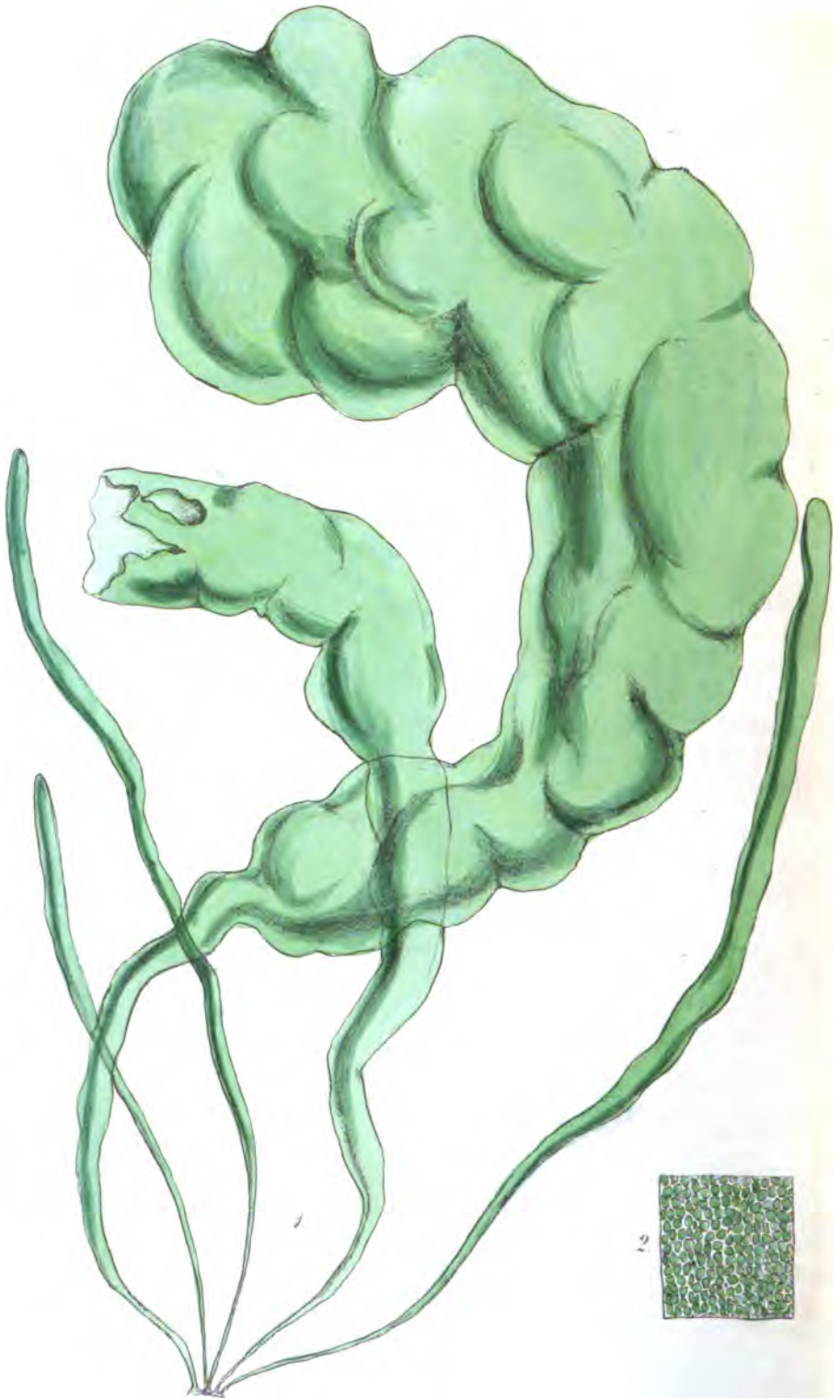


PLATE CLIV.

ENTEROMORPHA INTESTINALIS, *Link.*

GEN. CHAR. *Fron*d tubular, membranaceous, of a green colour and reticulated structure. *Fructification*; granules, commonly in fours, contained in the cellules of the frond. ENTEROMORPHA (*Link.*),—from *εντροπον*, an *entail*, and *μορφη*, *form* or *appearance*.

ENTEROMORPHA *intestinalis*; fronds perfectly simple, elongated, becoming inflated, obtuse, tapering extremely to the base.

ENTEROMORPHA *intestinalis*, *Link. Hor. Phys. Ber.* p. 5. *Grev. Alg. Brit.* p. 179. *Hook. Brit. Fl.* vol. ii. p. 313. *Harv. in Mack. Fl. Hib.* part 3. p. 242. *Harv. Man.* p. 174. *Wyatt, Alg. Danm.* no. 80. *E. Bot. Suppl.* t. 2756. *Kütz. Phyc.* p. 300.

SOLENTIA *intestinalis*, *Ag. Syst. Alg.* p. 185. *Spr. Syst. Veg.* vol. iv. p. 367.

SOLENTIA *Bertolini*, *Ag. Syst.* p. 185. *Spr. Syst. Veg.* vol. iv. p. 367.

SCYTOSIPHON *intestinalis*, *Lyngh. Hyd. Dan.* p. 67.

FISTULARIA *intestinalis*, *Grev. Fl. Edin.* p. 300.

ILEA *intestinalis*, *Gaill. Dict. Sc. Nat.* vol. 53. p. 373.

TETRASPORA *intestinalis*, *Desv. Fl. Angers.* p. 17.

ULVA *intestinalis*, *Linn. Huds. Fl. Ang.* p. 568. *Lightf. Fl. Scot.* p. 968.

Ag. Syn. p. 45. *Ag. Sp. Alg.* vol. i. p. 418. *Hook. Fl. Scot.* part 2. p. 91.

CONFERYA *intestinalis*, *Roth. Cat. Bot.* vol. i. p. 159.

HAB. Attached to various substances in the sea, between tide-marks; also in brackish and fresh-water ditches near the coast. Often floating. Annual. Summer. Very common.

GEOR. DISTR. In similar situations, in most parts of the world.

DESCR. *Root* a minute, scutate disc. *Fron*d from a few inches to one or more feet in length, and from a line to three or four inches, or more in diameter, tubular, obtuse, tapering at base to little more than the diameter of hog's bristle, gradually becoming inflated upwards, and in old age often swelling out into a large membranous bag, which is variously crisped and curled. Sometimes the whole frond is compressed, and very much crisped. *Substance* thin and membranous, but not gelatinous, not closely adhering to paper in drying. *Colour* varying from a transparent yellowish green, to a full grass-green; in old age and decay fading to a dirty white. Under the microscope, a portion of the frond exhibits the appearance of a transparent membrane, covered with green, unequal, angular cells.

A very common shore plant in all parts of the world, extending from the limits of vegetation in the Northern Hemisphere through all intervening latitudes to a similar point in the south; and inhabiting not merely the sea, but brackish, or even fresh-water,

ditches in the neighbourhood of the coast. It varies greatly in size, and in the degree of inflation, but in no other characters. Broad varieties of *E. compressa* strongly resemble some of its states, but these are always *branched*, though often in a very slight degree; whereas *E. intestinalis* is invariably simple. The compressed variety has most the look of a distinct species, and may be sometimes confounded with *Ulva linza*, under which name I have sometimes seen it in Herbaria; but the form of these plants is sufficiently different, the one being truly lanceolate, the other obtuse at one end, and very much attenuated at the other.

I am indebted to the Rev. J. Pollexfen for a prepared specimen of Sea-weed, which seems to be an *Enteromorpha*, probably our *E. intestinalis*, and which is used by the inhabitants of Japan as an ingredient in their soups, much as Macaroni is employed with us. Thunberg, in his travels, mentions that several of the *Ulva* and *Fuci* are so employed by the Japanese. In the present instance, the fronds have been freed of their salt, bleached, and tied up in cylindrical bundles, about a foot in length, and four inches in diameter, and, at first sight, have the look of Isinglass. The specimen was given to Mr. Pollexfen by Mr. Reeves of Clapham, who had it from a Dutch gentleman, to whom it had been sent from Batavia, to which place vessels trading to Japan bring it with other articles. It is also said to be in use in China.

Fig. 1. ENTEROMORPHA INTESTINALIS, in various stages of growth:—*of the natural size.* 2. Minute portion of the surface:—*magnified.*

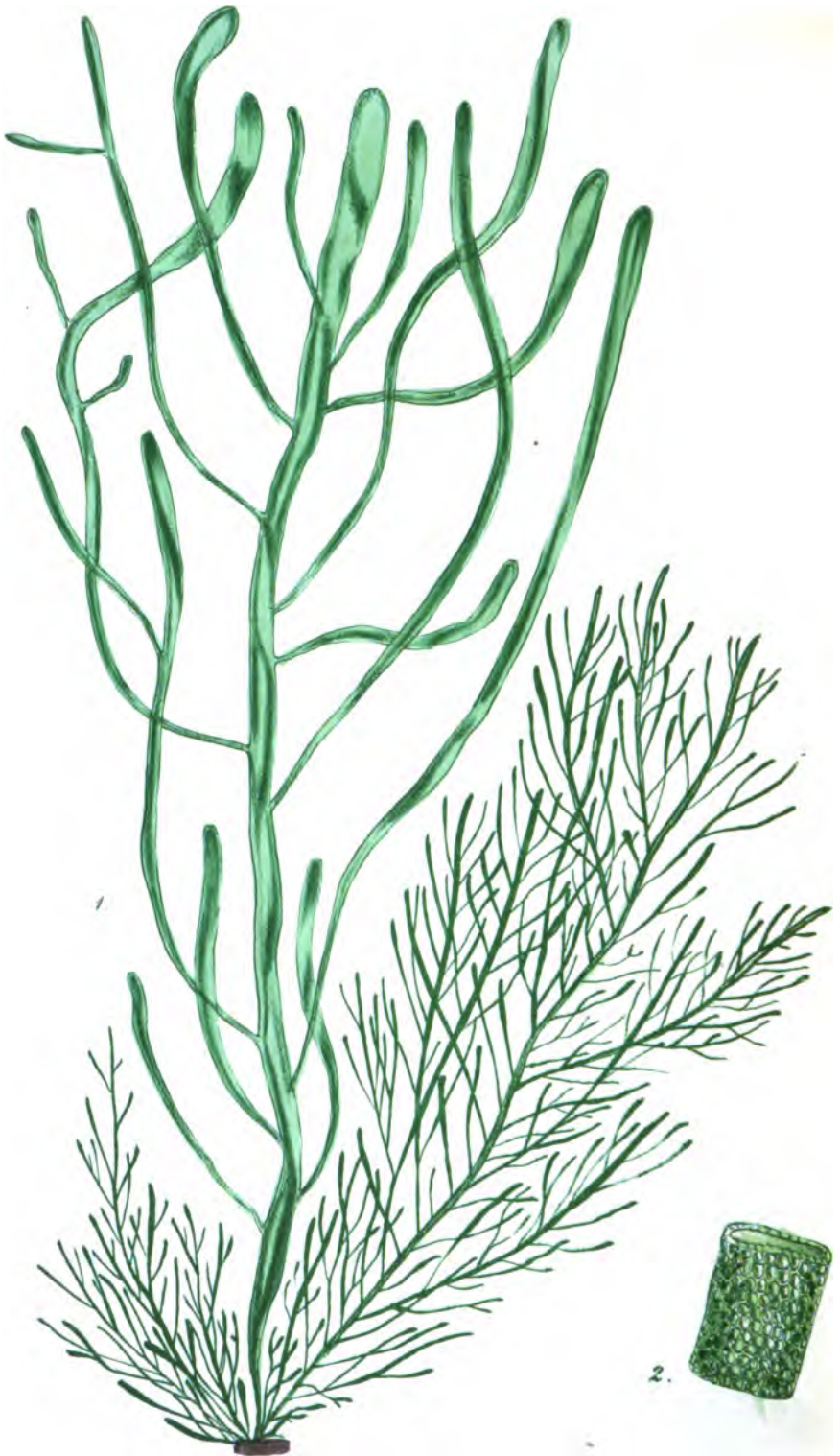


PLATE CCCXXXV.

ENTEROMORPHA COMPRESSA, *Grev.*

GEN. CHAR. *Fronde* tubular, membranaceous, of a green colour and reticulated structure. *Fructification*, granules, commonly in fours, contained in the cellules of the frond. ENTEROMORPHA (*Link*),—from *εντρον*, an *entail*, and *μορφή*, *form* or *appearance*.

ENTEROMORPHA *compressa*; fronds elongated, branched, cylindrical, or sub-compressed; the branches simple, or nearly so, long, obtuse, much attenuated at the base.

ENTEROMORPHA *compressa*, *Grev. Alg. Brit.* p. 180. tab. xviii. *Hook. Br. Fl.* vol. ii. p. 314. *Harv. Man.* ed. 1. p. 174. ed. 2. p. 213. *Harv. in Mack. Fl. Hib.* part 3. p. 242. *Wyatt, Alg. Danm.* No. 165. *Kütz. Sp. Alg.* p. 480.

SOLENIA *compressa*, *Ag. Syst. Alg.* p. 186.

FISTULARIA *compressa*, *Grev. Fl. Edin.* p. 300.

ULVA *compressa*, *Linn. Fl. Suec.* p. 433. *Lightf. Fl. Scot.* vol. ii. p. 969. *Ag. Sp. Alg.* vol. i. p. 420. *Sm. E. Bot.* t. 2739.

ILEA *compressa*, *Gaill. Dict. Sc. Nat.* vol. iii. p. 373.

SCYTOSIPHON *compressus*, *Lymb. Hyd. Dan.* p. 64. t. 15. A. B.

CONFERVA *compressa*, *Roth, Cat. Bot.* vol. i. p. 161.

HAB. On rocks, stones, and woodwork in the sea between tide-marks, in æstuaries, &c. Annual. Vegetates at all seasons. Excessively common.

GEOG. DISTR. Generally diffused throughout temperate and tropical latitudes, in both hemispheres.

DESCR. *Root* a small disc. *Fronde*s tufted, or clothing wide spaces of rock, from an inch to six or twelve inches long or more, sometimes as fine as hair, sometimes half an inch or more in breadth, extremely variable in aspect and in ramification. The wider specimens are often but slightly branched, having a principal stem furnished with several, irregularly inserted, long and simple lateral branches; the narrower individuals are repeatedly divided; their branches bearing one or more sets of lesser branches; and other varieties have the branches, or the whole plant, clothed on all sides with slender capillary ramuli. All the branches, and their divisions, taper greatly toward the base, and the apices are generally blunt. The tube is more or less strongly compressed in most cases, but some of the wider varieties are inflated, in which case they can only be known from *E. intestinalis* by being branched. The colour is a beautifully brilliant green, and the surface glossy as silk. The substance is membranous, and adheres but imperfectly to paper.

This plant is dispersed almost over the whole explored ocean, having been brought from nearly every shore, except those few antarctic coasts where nothing marine vegetates, save *Diatomaceæ*. I have never seen a collection of Algæ, of any extent, from any part of the world, which did not contain specimens of *Enteromorpha compressa*. Though always recognizable by the character of its branches tapering toward the base, it puts on a multitude of aspects according to the situation in which it grows. Near high-water mark it forms a short, shaggy pile, of slender fronds, spreading over rocks and stones, and most treacherous to the stepping of unwary feet, being pre-eminently slippery. A little lower down, in the rock-pools, it has the appearance of the varieties figured in our plate; and where fresh-water streams flow into the sea, it becomes broader, with inflated tubes, and often of great length. Such forms closely resemble *E. intestinalis*, which, however, is never branched. Other varieties occur on floating timber, on piles exposed to the tide, and on the vertical walls of quays in tidal rivers; in fact, in nine cases out of ten, when such objects are seen clad in green, the appearance is caused by the presence of this species.

Fig. 1. Sundry varieties of *ENTEROMORPHA COMPRESSA*:—*of the natural size.*
2. A small portion of a branch magnified, to show the cellular structure.



PLATE CCCXLIV.

ENTEROMORPHA LINKIANA, *Grev.*

GEN. CHAR. *Fron*d tubular, membranaceous, of a green colour and reticulated structure. *Fructification*, granules, contained in the cells of the membrane. ENTEROMORPHA (*Link*),—from *εντροπον*, an *entrail*, and *μορφη*, *form* or *appearance*.

ENTEROMORPHA *Linkiana*; “fronds cylindrical, tubular, filiform, reticulated, pellucid, of a very pale green colour, membranaceous (rigid when dry), much branched; branches attenuate.”—*Grev.*

ENTEROMORPHA *Linkiana*, *Grev. Alg. Brit.* p. 182. *Hook. Br. Fl.* vol. ii. p. 314. *Harv. Man.* ed. 1. p. 174. ed. 2. p. 213. *Kütz. Sp. Alg.* p. 481.

HAB. Between tide-marks. Annual. Summer. At Appin, *Captain Carmichael*.

GEOG. DISTR. — ?

DESCR. “*Root* a minute disc. *Fron*d six to twelve inches in length, filiform, cylindrical, tubular, inflated, rising with a main stem about one line in diameter, on all sides of which, and along the whole length, the branches are inserted; branches two to six inches long, smaller in diameter than the stem, between erect and spreading, set with a second series one or two inches long, which, in their turn, bear a third, which are quite capillary, all of them much attenuated toward the extremity. The *structure* distinctly reticulated, the reticulations roundish, but angular. *Fructification*, three or four subglobose granules within many of the reticulations. *Substance* membranaceous, but firm and somewhat cartilaginous when dry, adhering very imperfectly to paper. *Colour* a very pale, yellowish green.”—*Grev. l. c.* (I do not find more than *one* granule in each fertile cell, but three or four fertile cells generally cluster together.)

I prefer copying the above description from Dr. Greville's work, because my knowledge of this species (or form) is limited to a single specimen collected by Capt. Carmichael, and now preserved in the Dublin University Herbarium. From this specimen the figure has been taken. It will be seen that while the external habit is peculiar, the microscopic characters are very similar to those of *E. clathrata*, *E. erecta*, and *E. ramulosa*. Dr. Greville lays stress on the rigidity of substance, which is very observable in the dry state at least. The branches are of

larger diameter than is common in *E. clathrata*, but this is a character of little moment in this genus, and the very pale colour may arise from the peculiar circumstance under which the plant grew :—as, if the specimens were collected in a shallow pool near high-water mark they would assuredly be pale. In such circumstances any species of the genus would be equally bleached.

Fig. 1. ENTEROMORPHA LINKIANA :—*the natural size*. 2. Part of a branch and ramuli :—*magnified*. 3. Small fragment of the membrane, with fertile cells :—*highly magnified*.



PLATE XLIII.

ENTEROMORPHA ERECTA, *Hook.*

GEN. CHAR. *Fronde* tubular, membranaceous, of a green colour and reticulated structure. *Fructification*; granules, commonly in fours, contained in the cellules of the frond. ENTEROMORPHA—from *ἐντροπον*, an *entrail*, and *μορφή*, *form*, or *appearance*.

ENTEROMORPHA *erecta*; frond cylindrical, filiform, slender; branches erect, opposite or alternate, all attenuated to a fine point; ramuli capillary, erecto-patent; reticulations rectangular, nearly square, arranged in many longitudinal lines.

ENTEROMORPHA *erecta*, *Hook. Br. Fl.* vol. ii. p. 314. *Wyatt. Alg. Danm.* no. 166. *Harv. Man.* p. 175.

ENTEROMORPHA *clathrata*, *β. erecta*, *Grev. Alg. Brit.* p. 181. *Harv. in Mack. Fl. Hib.* part 3. p. 242.

SCYTOSIPHON *erectus*, *Lyngb. Hyd. Dan.* p. 65. t. 15.

FISTULARIA *erecta*, *Grev. Fl. Edin.* p. 300.

SOLENTIA *clathrata*, var. *confervoidea*, *Ag. Syst. Alg.* p. 187.

HAB. On rocks in the sea, and in rocky submarine pools, at about half-tide level; also dredged in 4–6 fathom water. Annual. Spring and Summer. Not uncommon.

GEogr. DISTR. The temperate and tropical zones of both hemispheres.

DESCR. *Fronde* from four to eight inches in height, cylindrical, varying from the thickness of a hog's bristle to half a line or a line in diameter. *Stem* usually undivided, tapering at the base and apex to a fine point, closely set throughout the greater part of its length with opposite or alternate, simple, erect or erecto-patent branches, the lowermost of which are longest, the upper gradually diminishing towards the upper part of the frond, all of them attenuated, like the stem, to an exceedingly fine point. The branches are well furnished with slender, subdistichous or irregularly quadrifarious, setaceous, short ramuli, and have a beautifully feathery appearance. The *structure* consists of a delicate membrane, composed of square or oblong-rectangular cells, each containing a dense endochrome, which in a state of fruit separates into about four distinct granules. *Colour* a brilliant grass-green. *Substance* glossy, tender, and adhering to paper in drying.

I have cautiously confined myself in making the above description to the typical variety of this variable plant, a specimen of which, communicated by Mrs. Griffiths, is represented in our plate. In the "*Manual*" I have recorded my agreement in opinion with Dr. Greville, Sir Wm. Hooker, and, indeed, with the

majority of botanists, that the several forms called *E. erecta*, *E. clathrata*, and *E. ramulosa* are but different states of one species; and may now add that *E. Linkiana*, of Greville, and *E. Hopkirkii*, Mc'Calla, are, in my judgment, equally doubtful. Still, as the plants which have received these names present very different aspects, and from their size cannot be presented in the same plate, it is my intention to give separate figures and descriptions of all of them, and then to leave it to the judgment of botanists whether to adopt the notion of one *protean* species, or of many less variable, but still *anastomosing* species, or, more properly, *races*.

E. erecta is one of the most beautiful forms, particularly when dredged in deeper water than comes within the usual tide range. Such are the specimens represented in our plate, which were dredged in Torbay. In these the ramuli are even more feathery than the figure exhibits.

Fig. 1. ENTEROMORPHA ERECTA:—*natural size*. 2. A branch:—*magnified*.
3. Portion of the membrane:—*highly magnified*.



PLATE CCCXL.

ENTEROMORPHA CLATHRATA, *Grev.*

GEN. CHAR. *Fronde* tubular, membranaceous, of a green colour and reticulated structure. *Fructification*, granules, commonly in fours, contained in the cells of the frond. ENTEROMORPHA (*Link*),—from *εντερων*, an *entail*, and *μορφή*, *form* or *appearance*.

ENTEROMORPHA *clathrata*; frond cylindrical, filiform, slender, highly reticulated; branches spreading, much divided, set with divaricated or recurved, slender, spine-like ramuli.

ENTEROMORPHA *clathrata*, *Grev. Alg. Brit.* p. 181 (in part). *Hook. Brit. Fl.* vol. ii. p. 315. *Wyatt, Alg. Danm.* No. 34. *Harv. Man. ed. 1.* p. 175. *ed. 2.* p. 214. *Kütz. Sp. Alg.* p. 479.

SOLENTIA *clathrata*, *Ag. Syst. Alg.* p. 186.

SCYTOSIPHON *clathratus*, *Lyngb. Hyd. Dan.* p. 66. t. 16.

SCYTOSIPHON *paradoxus*, *Fl. Dan.* t. 1595. f. 2.

ULVA *clathrata*, *Ag. Syn.* p. 46.

CONFERVA *clathrata*, *Roth, Cat. Bot.* vol. iii. p. 175.

CONFERVA *paradoxa*, *Dillw. Conf.* p. 70. t. F. *E. Bot.* t. 2328.

HAB. In rock-pools, between tide-marks. Annual. Spring and Summer. Not uncommon.

GEOG. DISTR. Shores of Europe.

DESCR. *Root* a small disc. *Fronde* densely tufted, often inextricably tangled together at the base, from six to eight inches long or more, varying in diameter from the fineness of human hair to that of stout bristles, excessively and irregularly branched; the branches issuing at all sides, of very unequal lengths, patent, and attenuated at the apex, ending in a fine point. The principal branches are furnished with a varying number of lesser divisions, and all are more or less copiously beset with short, slender, awl-shaped, simple or forked, spine-like ramuli, which stand out nearly horizontally from the branches. *Reticulations* of the membrane of large size, and somewhat quadrate. *Colour* of a fine, clear grass-green, becoming paler when dried. *Substance* soft and flaccid, membranous. In drying the plant adheres pretty firmly to paper.

This is nearly related to *E. ramulosa*, but is of a much softer substance, usually more slender in its tube, and more repeatedly

branched, so that its tufts are more bushy and feathery. It frequently lies prostrate, forming a widely spreading fleecy covering either to rocks or to mud, but this character is not very constant. To *Ent. erecta* (Plate XLIII.) it is also very closely allied, but is of less plummy habit than that species, with less difference in diameter between the main stems and branches and their lesser divisions, and the ramuli are shorter and more squarrose. Still, it must be confessed that there is a greater resemblance between these three species, in microscopic characters, than a *species-maker* would desire ; and I remain of the opinion formerly expressed, that no great violence would be done to truth by regarding them all as forms of one Protean species.

Fig. 1. ENTEROMORPHA CLATHRATA ;—Tuft *the natural size*. 2. Part of a branch :—*magnified*. 3. One of the ramuli :—*highly magnified*.

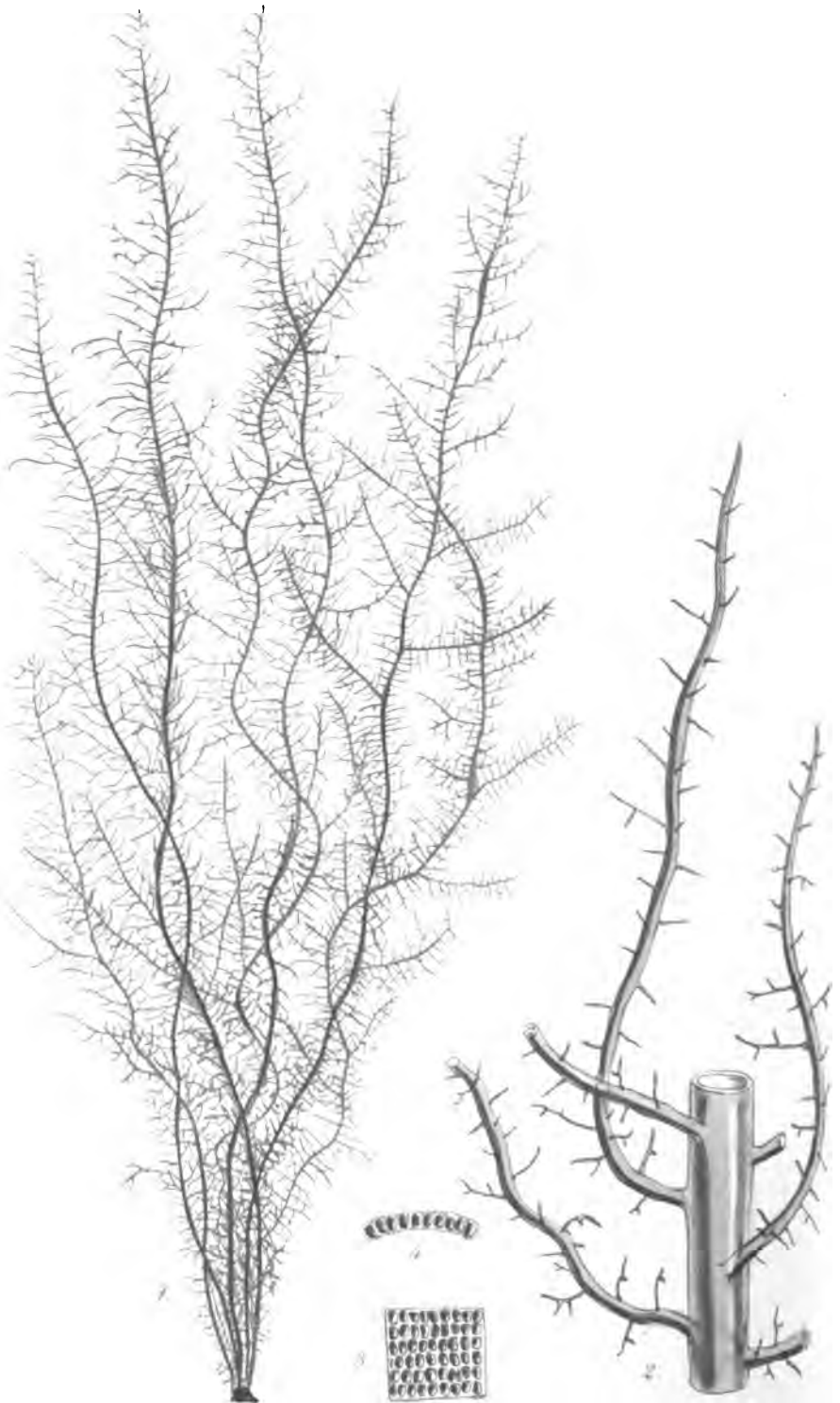


PLATE CCXLV.

ENTEROMORPHA RAMULOSA, *Hook.*

GEN. CHAR. *Fronde* tubular, membranaceous, of a green colour, and reticulated structure. *Fructification*; granules, commonly in fours, contained in the cellules of the frond. ENTEROMORPHA (*Link.*),—from *ἐντροπον*, an *entrail*, and *μορφή*, *form* or *appearance*.

ENTEROMORPHA *ramulosa*; frond subcompressed, highly reticulated, irregularly divided; the main divisions long, densely set with lateral branches; branches curved, curled or twisted, everywhere clothed with short, spine-like ramuli.

ENTEROMORPHA *ramulosa*, *Hook. Br. Fl.* vol. ii. p. 315. *Harv. Man.* p. 175. *Wyatt, Alg. Damn.* no. 208.

ENTEROMORPHA *clathrata*, γ . *uncinata*, *Grœv. Alg. Brit.* p. 181.

ULVA *ramulosa*, *E. Bot.* t. 2137.

ULVA *uncinata*, *Mohr. Cat. Alg.* fide *Ag.*

HAB. Rocks and stones, between tide-marks. Annual. Spring.

GEOGR. DISTR. Shores of Europe.

DESCR. *Fronde* from six inches to one or two feet in length, densely tufted, and often woven together into an inextricable mat, irregularly branched. Main stems frequently undivided or but slightly divided, furnished throughout with densely set, short, horizontal branches of very unequal length, some of them being not half an inch and others two or three inches long. These branches bear an abundance of short, spine-like, simple or slightly branched, scattered, setaceous or capillary ramuli, very much more slender than the part from which they spring. The stem and branches all taper to a fine point. The colour is an intense grass-green, of much brilliancy, and well preserved in drying. The substance membranaceous, rather harsh to the touch from the abundance of short spreading ramuli that cover the branches. In drying the frond adheres, but not very closely, to paper.

A common form of *Enteromorpha*, but scarcely more than a form. Under Plate XLIII. of our first volume I have stated that I regard *E. ramulosa* as merely one of the varieties of *E. clathrata*, and that both the plants so called have so much in common with *E. erecta* and others of the genus, that it is doubtful whether all are not merely varieties of one Protean species. To this opinion I still adhere. Nevertheless, as the extreme

states described by botanists are outwardly dissimilar, I have determined to figure them all.

The present variety is distinguished by its squarrose habit, full green colour, and rather harsh feel. When young and untangled, as in our figure, it is not unsightly; but in age it often forms an inextricable fleecy mass, spreading widely over the surface of the ground, and forming a comfortable cover for a variety of small crustacea and shell-fish; but in this state it is not to be recommended to the seeker of specimens for the Herbarium.

Fig. 1. ENTEROMORPHA RAMULOSA:—*of the natural size.* 2. Portion of the stem with small branches and ramuli. 3. Fragment of the surface of the frond. 4. Part of transverse section:—*magnified.*



PLATE CCLXIII.

ENTEROMORPHA HOPKIRKII, *M'Calla*.

GEN. CHAR. *Fronde* tubular, membranaceous, of a green colour, and reticulated structure. *Fructification*; granules, commonly in fours, contained in the cellules of the frond. ENTEROMORPHA (*Lin.*),—from *εντερον*, an *entail*, and *μορφή*, *form* or *appearance*.

ENTEROMORPHA *Hopkirkii*; frond excessively slender and byssoid, flaccid, very much branched; branches feathery, decomposed, erect, attenuated, set with minute, subulate ramuli; cellules large, hyaline, each cell containing one or two minute grains of endochrome; the ramuli composed of a single series of such cellules.

ENTEROMORPHA *Hopkirkii*, *M'Calla*, *Alg. Hib. ined. Harv. in Phyc. Brit.* vol. i. pl. XV. *Harv. Man. ed. 2. p.*

HAB. Dredged in 4–10 fathoms water. Annual. Summer and autumn. Goodrington, Torbay, *Mrs. Griffiths* (1838). Carrickfergus, *Mr. M'Calla* (1845).

GEOG. DISTR. — ?

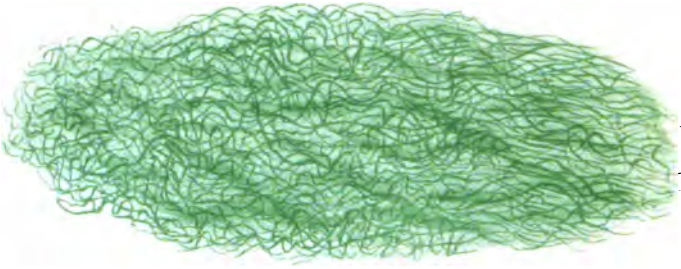
DESCR. *Fronde* six to twelve inches long or more, of exceedingly fineness and delicacy, the main stems being scarcely the diameter of human hair, the branches and ramuli very much more slender; excessively branched and feathery, the branches erect, straight, alternate, or rarely opposite, tapering to a fine point, repeatedly decomposed, the ultimate divisions set with minute, awl-shaped ramuli. The structure of the frond is peculiarly lax. The cells in the branches are of large size, about three or four visible in the breadth of the branch, hyaline, containing generally a single small grain of grass-green endochrome or *chlorophyll*. The ultimate ramuli consist of a single series or string of such cells, or, in other words, are articulated. There is much less difference between the diameter of the larger and smaller branches in this species than in most others of the genus. *Colour* a pale yellowish green, becoming paler in drying. *Substance* exceedingly flaccid and tender, most closely adhering to paper in drying.

I am not prepared to defend the *characters* of all the species of the genus *Enteromorpha*; but among our British kinds the present one is remarkable for having some points easily recognisable, and for being a plant of much delicacy and beauty. It rivals in the tenuity of its fronds, and in their bushy branching, the most delicate of the *Cladophoræ*, having, to the naked eye, an aspect not very unlike that of *C. Rudolphiana*, and being more slender than *C. gracilis*. Under the microscope it is known by the very

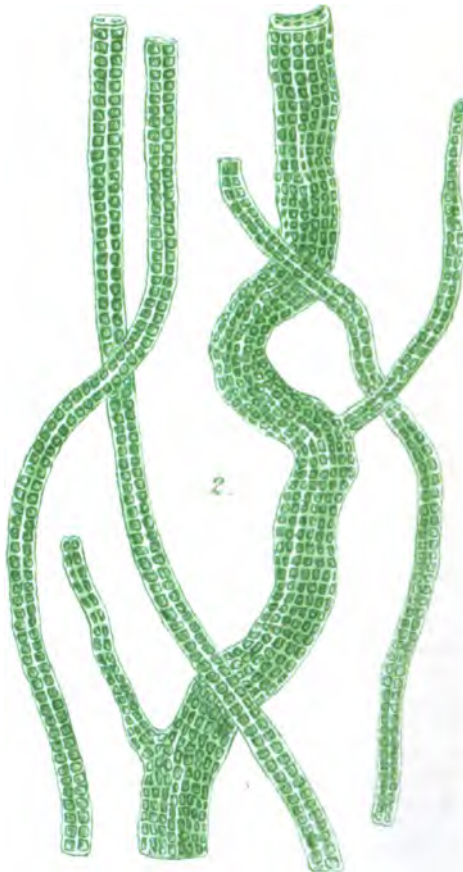
large size of its nearly empty cells, in the centre of which a small spherical grain of emerald-green endochrome is found. The ramuli are so slender that they consist of a single row of such cells, and thus have something the character of the threads of a *Conferva*.

My first knowledge of this species was from specimens dredged in 1838 by Mrs. Griffiths in Torbay. They remained in my Herbarium unnamed until the plant was again found, in 1845, by the late Mr. M'Calla, who bestowed the name as a tribute of grateful respect to Mr. Thomas Hopkirk, author of "Flora Glottiana," from whom he had received kindness whilst resident in the neighbourhood of Belfast. In now adopting Mr. M'Calla's specific name I wish to record the regret I feel, in common with all naturalists acquainted with his merits, that death should so soon have closed a career which opened with much promise of future fame. The readers of the Phycologia must be well acquainted with the name of Mr. William M'Calla, in connection with the habitats of many of our rarest Algæ. It is therefore almost superfluous to say that he was well acquainted with the species, and had a most acute eye to detect a minute species, and a most accurate judgment to discriminate one varying form from another. But though Algæ were the natural objects in which, of late, he chiefly delighted, he had a very extensive knowledge of marine zoology, and has made large additions to the Irish Faunæ. Born in very humble circumstances, imperfectly educated, and always with narrow means, he had to struggle through life with many hindrances to progress. That he overcame many of those hindrances is a proof of his talents and energy; that he did not overcome all may well be forgotten by those who have not had to struggle with any, and yet feel disposed to criticise the short-comings of others. Mr. M'Calla fell a victim to Cholera, in May 1849, aged about 35.

Fig. 1. ENTEROMORPHA HOPKIRKII:—*of the natural size.* 2. Portion of a branch:—*magnified.* 3. Small fragment of the same, with its subulati ramuli:—*very highly magnified.*



1.



2.

PLATE CCCLII.

ENTEROMORPHA PERCURSA, *Hook.*

GEN. CHAR. *Fron*d tubular, membranaceous, of a green colour and reticulated structure. *Fructification*: granules, commonly in fours, contained in the cells of the frond. ENTEROMORPHA (*Link*),—from *εντερον*, an *ent*rail, and *μορφη*, *form* or *appearance*.

ENTEROMORPHA *percursa*; frond capillary, entangled and variously twisted, simple or having a few short spine-like ramuli, compressed, solid (?), reticulated; cells quadrate, two or more (generally two) in the breadth of the frond, the endochrome nearly filling the cell.

ENTEROMORPHA *percursa*, *Hook. Br. Fl.* vol. ii. p. 315. *Harv. Man.* ed. 1. p. 176. (*not ed. 2. p. 215, where the specific character applies to E. Ralfsii, Harv. Phyc. Br. t. CCLXXXII.*)

SOLENTIA *percursa*, *Ag. Syst.* p. 187.

SCYTOSIPHON *compressus*, γ *confervoideus*, *Lyngb. Hyd. Dan.* p. 65. t. 15. f. B. 4-6.

HAB. Muddy sea-shores, at half-tide level. Annual. Spring and summer. Appin, *Capt. Carmichael*. Larne, *Mr. D. Moore*. Clontarf, *Miss Ball* (!). Tor Abbey, *Mrs. Griffiths* (mixed with *Lyngbya Carmichaelii*, &c.)

GEOGR. DISTR. Shores of Northern Europe.

DESCR. *Fron*ds decumbent, several inches in length, forming widely spreading, entangled strata; each separate frond variously curled and twisted, and ordinarily of the diameter of human hair. Such fronds are usually quite simple, and formed of a double row of quadrate cells, filled with endochrome, with hyaline borders to each cell; thus the filament appears to be traversed by a colourless central line. Mixed with these characteristic threads are others of twice or four times the diameter, formed of a larger number of rows of cells; and these filaments, which have much the aspect of young plants of *E. compressa*, are frequently furnished with short, or long, simple branches, formed, like the ordinary threads, of a double row of cells. I have not been able (in dried specimens) to find any cavity traversing the filament, as is usual in the genus. The cells composing the filaments are nearly filled with green matter, leaving narrow borders. The colour is a brilliant grass-green, which is generally well preserved in drying; and the substance is membranaceous, and rather soft.

At Plate CCLXXXII. I have already given, under the name *E. Ralfsii*, a representation of an *Enteromorpha* communicated

to me by Mr. Ralfs as *E. percursa*, but which our friend Mr. Thwaites decided to belong to a different species. In the present figure I hope I have given the true plant, but not having had the advantage of examining any authentically-named specimens, I am obliged to trust to the general accordance of the specimens here figured with the description given by Carmichael. My figure is drawn from a specimen collected by Miss Ball some years ago at Clontarf, and now in Herb. T. C. D., and it sufficiently accords with such specimens as I have examined from other parts of the coast. If the threads were all of one diameter, and all built of a double row of cells, there could be no difficulty in ascertaining the identity of the species; but unfortunately this is far from being the case in any specimen I have seen. The character by which *E. Ralfsii* differs is, the large size of the cells and the minuteness of the grain of endochrome in each. This, in the specimens seen, is very obvious. How far it may be of specific importance I cannot say.

Fig. 1. ENTEBOMORPHA PERCURSA :—*the natural size.* 2. Portions of filaments of various sizes :—*highly magnified.*



PLATE CCLXXXII.

ENTEROMORPHA RALFSII, *Harv.*

GEN. CHAR. *Fronde* tubular, membranaceous, of a green colour, and reticulated structure. *Fructification*: granules, commonly in fours, contained in the cells of the frond. ENTEROMORPHA (*Link*),—from *εντερων*, an *entrail*, and *μορφη*, *form* or *appearance*.

ENTEROMORPHA *Ralfsii*; frond capillary, simple, or having a few short, spine-like ramuli, nearly solid, laxly reticulated; the cells large, hyaline (two to four in the breadth of the frond), each cell containing a brilliant-green grain of endochrome.

HAB. On the oozy sea-shore, above half-tide level, spreading widely. Annual. Summer. Bangor, North Wales, &c., *Mr. Ralfs*.

GEOGR. DISTR. (?)

DESCR. *Fronde* many inches long, exceedingly slender, varying from less than the diameter of human hair to nearly that of horsehair, densely aggregated, decumbent, and spreading in wide, continuous strata, which cover any object they encounter. Each frond is simple, unbranched, or rarely having a few short, spine-like ramuli scattered here and there; it is curled or flexuous, and sometimes the fronds are so much rolled together and bundled, that it is difficult to disentangle them. The cells of which the frond is composed are remarkably large, sometimes two, sometimes four forming the breadth of the filament; each cell is hyaline, glassy, somewhat distended, and contains a bright-green grain of endochrome in its centre. I have not observed any fructification.

I had prepared the plate here given for the purpose of illustrating *Enteromorpha percursa*, in the full belief that the specimens from which I made my figure were authentic examples of that species, having received them from Mr. Ralfs under that name:—but, happening to show the figure to my friend Mr. Thwaites, that acute botanist assured me that *E. percursa* was something very different. I admit that the diagnosis of *E. percursa* given by Carmichael will not apply to my plant. Of the original *E. percursa* I have, then, as yet seen no specimens, and the plate having been engraved and printed I cannot hold it back for a more minute examination and consultation. I am, therefore, compelled to publish Mr. Ralfs's plant as a novelty, and (if it be new) have great pleasure in bestowing his name

upon it. The greater number of cells in the breadth of the frond, and the presence of occasional short ramuli, would seem to be the characters by which *E. Ralfsii* is to be known from the true *E. percursa*. I have no opportunity at present (I write these lines on the shores of America) of examining other specimens, of consulting herbaria, or of communicating with more experienced botanists, and must consequently defer till a future time entering more fully into the distinctive characters of the species now proposed.

Fig. 1. Tuft of *ENTEROMORPHA RALFSII*:—*the natural size*. 2. Small fragments of different filaments. 3. A transverse section of a filament:—*both magnified*.



PLATE CLXXI.

ULVA LATISSIMA, *Linn.*

GEN. CHAR. *Fronde* membranaceous, green, expanded, plane, (in some cases saccate when young,) composed of irregular cells. *Fructification*; *granules*, often arranged in fours, scattered over the whole frond. ULVA,—supposed to be from *Ul*, *water*, in Celtic.

ULVA *latissima*; frond broadly-ovate or oblong, flat, of a full green colour.

ULVA *latissima*, *Linn. Fl. Suec.* p. 433. *Ag. Sp. Alg.* vol. i. p. 407. *Ag. Syst.* p. 188. *Grev. Alg. Brit.* p. 171. *Hook. Br. Fl.* vol. ii. p. 311. *Wyatt, Alg. Danm.* no. 33. *Harv. in Mack. Fl. Hib.* part 3. p. 242. *Harv. Man.* p. 170. *J. Ag. Alg. Medit.* p. 17. *Kütz. Phyc. Gen.* p. 296. *Mont. Fl. Alg.* p. 149. *Endl. 3rd Suppl.* p. 19.

ULVA *lactuca*, *Sm. E. Bot.* t. 1551. (*not of Linn.*)

ULVA *lactuca*, var. *latissima*, *Lightf. Fl. Scot.* p. 971.

HAB. On rocks and stones in the sea between tide marks; and extending to ten fathoms water, or perhaps a greater depth. Annual. Summer and autumn. Very common on the British shores.

GEOG. DISTR. Throughout the ocean, nearly to the limits of vegetation in both hemispheres.

DESCR. *Root*, a small disc. *Fronde*s from six to twenty inches in length or more, and from three to twelve in breadth, growing in tufts; very variable in shape, oblong, or ovate, with the margin more or less sinuated and wavy, variously plaited, glossy, translucent, of a very soft, but rather firmly membranous, though exceedingly thin, substance, and vivid green colour. In old age the fronds are frequently found pierced by holes, and infested with *Myrionemata*, and are then usually of a pale green colour. Sometimes, especially in specimens dredged from deep water, the colour is of a very dark, and even bluish green, reflecting glaucous tints when under water. In drying, this plant loses much of its brilliancy, and scarcely adheres to paper. *Structure* composed of two strata of exceedingly small, fully coloured cells of irregular shape, separated by an imperfectly coloured, thin, cellular layer.

An exceedingly common species, found on all shores, and nearly in all latitudes. Except on the extreme antarctic coasts, where all vegetation, save the *Diatomaceæ*, is at an end, *Ulva latissima* may be said to inhabit every shore. It is as abundant in the tropics as in the temperate zone. Nor do specimens from different countries exhibit many minor points of difference. Some are of more rigid texture than others, but there is little else peculiar about them. The form is too variable among specimens

from the same locality to found any characters upon its gradations.

By older writers *Ulva latissima* was either entirely confounded with *U. lactuca*, or else was regarded as merely a variety of it. The distinctions are well pointed out by Dr. Greville, and are as visible in the young as in the full grown plant. *Ulva latissima* is, at all stages, a flat membrane, and in drying scarcely adheres to paper. *U. lactuca* is, at first, a closed sac, which soon bursts; it then exhibits a torn membranous frond, of a much more delicate substance than *U. latissima*, and of a paler colour; and in drying, it closely adheres to paper.

Lightfoot and succeeding authors tell us that *U. latissima*, under the name of *Oyster-green*, or *Green-Sloke*, is brought to table both in England and Scotland, used in the same manner as *Porphyra laciniata*, the true *Laver* or *Sloke*. I have never seen it so used. Lightfoot further says that "the Icelanders ascribe to it an anodyne virtue, and bind the leaves about the front and temples to assuage the head-ache in fevers, and to procure sleep; but the use of it in these intentions is supported by no good authority."—*Fl. Scot.* p. 971-2. If it have any effect in such cases, it probably arises from the cooling influence of the moisture retained in the leaves.

Fig. 1. *ULVA LATISSIMA*; a frond:—*of the natural size*. 2. Portion of the surface. 3. Section of the frond:—*highly magnified*.



2.

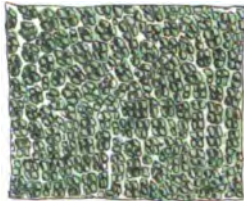


PLATE CCXLIII.

ULVA LACTUCA, *Linn.*

GEN. CHAR. *Fronde* membranaceous, green, expanded, plane, (in some cases saccate when young,) composed of irregular cellules. *Fructification*; *granules*, often arranged in fours, scattered over the whole frond. *ULVA* (*L.*),—supposed to be from *Ul, water* in Celtic.

ULVA lactuca; “frond at first obovate, saccate, inflated, at length cleft down to the base; the segments plane, unequal, lacinated, semi-transparent.” *Grev.*

ULVA lactuca, *Linn. Sp. Pl.* p. 1632. *Lightf. Fl. Scot.* p. 970. in part. *Ag. Sp. Alg.* vol. i. p. 409. *Ag. Syst.* p. 189. *Lyngh. Hyd. Dan.* p. 30. in part. *Grev. Crypt. Scot.* t. 313. *Grev. Alg. Brit.* p. 172. *Hook. Br. Fl.* vol. ii. p. 311. *Harv. Man.* p. 170.

HAB. On rocks, stones, shells, and the smaller algæ between tide-marks. Annual. May and June. Generally distributed round the British coasts, but less common than *U. latissima*.

GEOGR. DISTR. Shores of Europe.

DESCR. *Fronde* tufted, from two to six inches high, at first forming an obovate bag, closed at the summit, but soon bursting, and split quite to the base into two or more segments which are often irregularly lobed or divided, the margin sometimes entire, but oftener jagged. *Substance* very thin and delicate, semi-transparent, closely adhering to paper in drying. *Colour*, a peculiarly beautiful light yellowish green. The surface glossy when dry. Under the microscope the frond is seen to consist of closely packed, quaternate cells, lying in a transparent membrane.

To Dr. Greville belongs the merit, as far as British naturalists are concerned, of having first clearly pointed out the characters by which this delicate plant may be distinguished from the more common *U. latissima*, and therefore I have thought it best to preserve the diagnosis given by that author in his *Algæ Britannicæ*. The characters are most obvious in an early stage of growth, when the present plant forms an obovate sac, not very unlike a greatly distended *Enteromorpha*; while *U. latissima* is at all periods of its growth a flat membrane. Other characters are found in the substance and colour. *U. lactuca* is of a brighter and yellower green, and more glossy when dry; and its substance

is greatly more thin and delicate than that of *U. latissima*. The form of both plants is too variable to find a place among the distinctive characters. *U. latissima* is found at all seasons and on every shore; but *U. lactuca* is seldom seen except in spring or early summer.

Fig. 1. ULVA LACTUCA, young and old plant:—*the natural size.* 2. Small portion of the membrane:—*magnified.*



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PLATE XXXIX.

ULVA LINZA, *Linn.*

GEN. CHAR. *Fronde* membranaceous, green, expanded, plane (in some cases saccate when young), composed of irregular cellules. *Fructification*; *granules*, often arranged in fours, scattered over the whole frond. ULVA—supposed to be from *Ul, water* in Celtic.

ULVA *Linza*; frond linear lanceolate, acute, crisped at the margin, composed of two membranes closely applied.

ULVA *Linza*; *Linn. Sp. Pl.* p. 1633. *Lightf. Fl. Scot.* p. 973. *Fl. Dan.* t. 889. *Roth. Cat.* vol. ii. p. 246, and vol. iii. p. 330. *Ag. Syn.* p. 40. *Spec. Alg.* vol. i. p. 413. *Lyngb. Hyd. Dan.* p. 32. *Greov. Fl. Edin.* p. 299. *Alg. Brit.* p. 173. *Hook. Br. Fl.* vol. ii. p. 311. *Harv. in Mack. Fl. Hib.* part 3. p. 243. *Man.* p. 171. *Wyatt. Alg. Danm.* no. 164. *J. Ag. Alg. Medil.* p. 17.

SOLENTIA *Linza*, *Ag. Syst.* p. 185.

PHYCOSERIS *Linza*, *Kütz. Phyc. Gen.* p. 297.

TREMELLA *marina fasciata*, *Dill. Musc.* p. 46. t. 9. f. 6.

HAB. On rocks and stones in the sea, at half-tide level. Annual. Summer. Not uncommon.

GEOGR. DISTR. Atlantic and Mediterranean shores of Europe. New Zealand.

DESCR. *Root* a small callus. *Fronde* from six inches to one or even two feet in length, and from half an inch to two inches in width, linear-lanceolate, attenuated towards the base, and more or less tapering at the apex, waved and curling at the margin, membranaceous; composed of two distinct membranes closely applied together. *Fructification* scattered over the whole frond, to which it gives colour. *Colour*, a full, brilliant grass-green, fading in age. *Substance* thin, adhering to paper in drying.

This is one of the most beautiful of the British *Ulvæ*, as it is also one of the less common species. Its gracefully shaped, and elegantly curled fronds look peculiarly well as the plant waves freely in the water.

It has long been known to botanists, having been distinguished by Linnæus, and has been found on very distant shores. It inhabits the Southern as well as the Northern Oceans, probably extending nearly as far as vegetation extends to the south, though as yet we have not had it from any locality south of the Bay of Islands. The frond consists of a double membrane, so that it has been by some authors associated with the *Euteromorphæ*, to which group it affords a direct passage.

Fig. 1. *ULVA LINZA*, tuft of fronds :—*natural size*. 2. A portion of the membrane :—*magnified*.



PLATE CCXI.

PORPHYRA VULGARIS, *Ag.*

GEN. CHAR. *Fronde* delicately membranaceous, flat, purple. *Fructification*, granules, arranged in fours, scattered over the whole frond; also "scattered sori of oval spores." PORPHYRA (*Ag.*),—from πορφυρος, purple.

PORPHYRA *vulgaris*; frond simple, lanceolate, entire, the margin more or less waved.

PORPHYRA *vulgaris*, *Ag. Aufs.* p. 18. *Grev. Alg. Brit.* p. 169. *Hook. Br. Fl.* vol. ii. p. 310. *Wyatt, Alg. Damm.* n. 32. *Harv. in Mack. Fl. Hib.* part 3. p. 241. *Harv. Man.* p. 169. *Hook. fl. Fl. Antarct.* vol. ii. p. 500. *Kütz. Phyc. Gen.* p. 382. *Endl. 3rd. Supp.* p. 19.

PORPHYRA *purpurea*, *Ag. Syst. Alg.* p. 191.

PORPHYRA *linearis*, *Grev. Alg. Brit.* p. 170. t. 18. *Hook. Br. Fl.* vol. ii. p. 310. *Harv. in Mack. Fl. Hib.* part 3. p. 241. *Harv. Man.* p. 170. *Wyatt, Alg. Damm.* n. 163. *Endl. 3rd. Supp.* p. 19,

ULVA *purpurea*, *Rotk, Cat. Bot.* vol. i. p. 209. t. 6. *Lyngh. Hyd. Dan.* p. 29. *Ag. Sp. Alg.* vol. i. p. 405.

HAB. On rocks and stones between tide-marks. Annual. Nearly throughout the year. Abundant on the British shores.

GEOGR. DISTR. Throughout the Atlantic Ocean, from the Færoe Islands to Cape Horn. Kerguelen's Land.

DESCR. *Root*, a minute disc. *Fronde*s from one to two feet long, and from one or two lines to two or three inches in width, perfectly simple, lanceolate or linear, tapering much at the extremity, at first ovate at the base, afterwards more or less cordate, rising from a very minute linear stipe. In the narrower varieties the margin is nearly flat, and even; in the broader it is very much waved, but scarcely sinuous. *Fructifications* elliptical dark-purple granules, arranged in fours, dispersed through all the cells of the frond; and also "irregular scattered sori of larger, ovate granules, mostly situate near the base." (*Grev.*) *Substance* very thin and membranaceous, very glossy, shrinking much in drying and only imperfectly adhering to paper. *Structure* cellular; the frond composed of a double stratum of quadrate cells. *Colour* (owing to fructification) a more or less vivid purple.

This is distinguished from *P. laciniata*, already figured at our Plate XCII., by being perfectly simple at all ages, instead of being irregularly cloven; and by the much greater length of the frond in proportion to its breadth. Both are equally common, and widely dispersed over the world, and both indifferently may be

used in the preparation of marine-sauce or *Laver*. The subject of our present plate is the more beautiful of the two, being commonly of a much brighter colour than its congener, but like it, the brilliancy varies according to the forwardness of the fructification.

It will be seen, by reference to the plate, and synonyms quoted, that I propose to reduce the *P. linearis* of British authors to its original place as a narrow variety of *P. vulgaris*. It was originally separated by Dr. Greville in his *Algæ Britannicæ*, and this separation has been adopted in subsequent British works, though in the *Manual* I have expressed doubts of the validity of the supposed new species. When gathered in early winter, as in the month of November, it appears sufficiently distinct. Wide spaces of rock will be found clothed with narrow purple ribbons, as flat and free from undulations and as ovate at the base, with as distinct a stipes as are represented in figures 2 and 3. But two or three months later a considerable change will have taken place in the plants, their margins will be more uneven and their bases less ovate; and by the end of spring, it will be difficult to trace in the plants which will then cover the rocks the slender ribbons of winter. I admit that there are localities, very near high-water mark, where the frond never attains any great length or breadth, and therefore remains more true to the name *linearis*, but this stunted growth is clearly referable to deficient nourishment. Where the plant grows in deeper water the fronds gradually develop into the broad state represented at fig. 1. This figure represents but a small specimen; the frond is often two feet in length.

I am not acquainted with *P. amethystea*, Kütz., founded on a specimen collected by Mr. Shuttleworth on the Irish coast. Can it be merely a state of *P. vulgaris*?

Fig. 1. PORPHYRA VULGARIS. 2. Narrow state of the same, the *P. linearis* of authors;—both of the natural size. 3. Base of young frond. 4. Portion of surface, in fruit. 5. Vertical section of frond. 6. Tetraspore.



PLATE XCII.

PORPHYRA LACINIATA, Ag.

GEN. CHAR. *Fronde* delicately membranaceous, flat, purple. *Fructification*, granules, arranged in fours, scattered over the whole frond; also "scattered sori of oval spores." (Ag., Grev.). PORPHYRA (Ag).— from πορφύρος, purple.

PORPHYRA *laciniata*; frond deeply and irregularly cleft into several broad segments.

PORPHYRA *laciniata*, *Ag. Syst.* p. 190. *Ag. Ic. Alg. Eur.* t. 26, 27. *Grev. Alg. Brit.* p. 168. *Hook. Br. Fl.* vol. ii. p. 310. *Harv. in Mack. Fl. Hib.* part 3. p. 241. *Harv. Man.* p. 169. *Wyatt, Alg. Denm.* no. 32. *Endl. 3rd Suppl.* p. 19. *Kütz. Phyc. Gen.* p. 383.

PORPHYRA *umbilicalis*, *Kütz. Phyc. Gen.* p. 383.

ULVA *laciniata*, *Lightf. Fl. Scot.* p. 974. t. 33. *Roth, Fl. Germ.* p. 585. *Ag. Sp. Alg.* vol. i. p. 404.

ULVA *umbilicalis*, *E. Bot.* t. 2286. *Lyngb. Hyd. Dan.* p. 28.

HAB. On marine rocks, within the range of the tide. Annual. Spring to autumn. Abundant on all our shores.

GEOGR. DISTR. Throughout the Atlantic Ocean, from the Færoe Islands to the Cape of Good Hope.

DESCR. *Root*, a minute disc. *Fronde* two to eight inches long, clustered together, expanded, delicately membranaceous, pellucid, very irregularly divided into several lobes; the point of attachment frequently within the frond, which is then peltate. *Margin* wavy, entire or irregularly cut; apices often truncate. Under the microscope the whole frond appears to be divided into squares, in the manner of a tessellated pavement, and within each square are four purple granules, or spores, which constitute the fructification and the whole colouring matter of the frond. When not in a state of perfect fructification the colour is much less bright, tending to a livid olive. Besides the usual fructification, Dr. Greville describes a second, consisting of "sori of smaller ovate granules scattered without order chiefly towards the margins of the frond." These I am not acquainted with. In drying, the colour becomes much brighter; but the glossy and delicate fronds do not adhere closely to paper, and shrink very much.

This very common plant is found in most parts of the Ocean throughout the tropics, and exists nearly as far as vegetation extends towards the poles. It varies in different places, something in substance, being thicker or thinner; something in colour, being sometimes of a bright purple, and sometimes much tinged with olivaceous green; and something in form, some indi-

viduals having a flat lobed frond, and others a cup-shaped frond fixed by a central point. But all its forms are easily recognized, and may be traced by insensible gradations, one into the other.

The genus *Porphyra* is anomalous among the *Chlorosperms*, having the colour of the more perfectly organized *Rhodosperms*. From these latter it differs in its diffused fructification, and in this respect perfectly agrees with the *Ulvaceæ*, among which it is placed.

This species, together with the closely allied *P. vulgaris*, is sometimes brought to table in England under the name of *Laver*; and in Scotland and Ireland under that of *Sloke*, *Slouk*, or *Sloukawn*. After many hours boiling the frond is reduced to a somewhat slimy pulp, of a dark brown colour, which is eaten with pepper and lemon-juice or vinegar, and has an agreeable flavour to those who have once conquered the repugnance to taste it, which its great ugliness induces, and many persons are very fond of it. It might become a valuable article of diet, in the absence of other vegetables, to the crews of our whaling vessels cruising in high latitudes, where every marine rock, at half-tide, abundantly produces it. In its prepared state it may be preserved for an indefinite time in closed tin-vessels.

Fig. 1. PORPHYRA LACINIATA:—*of the natural size*. 2. Small portion of the frond, showing the quaternate granules:—*magnified*.

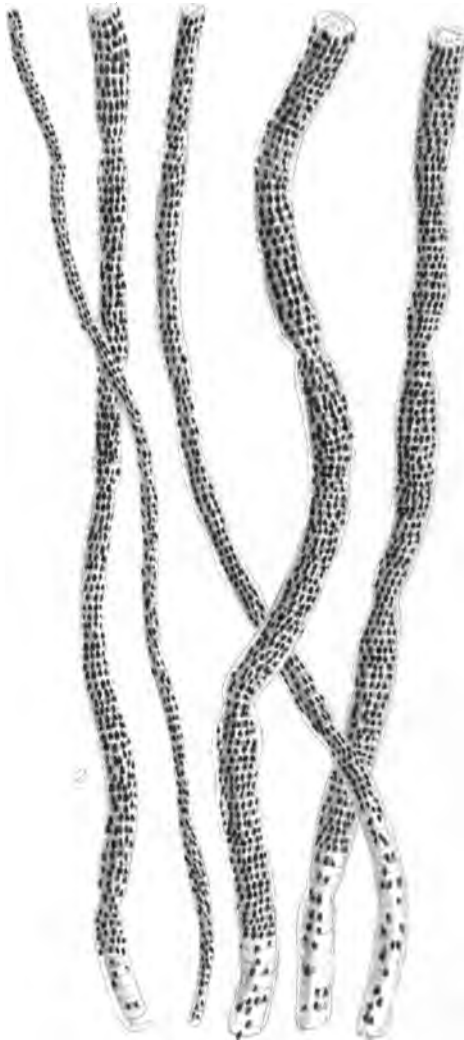


PLATE XCVI.

BANGIA FUSCO-PURPUREA, *Lyngb.*

GEN. CHAR. *Fronde* filiform, tubular, composed of numerous radiating cellules, disposed in transverse rows, and enclosed within a hyaline continuous sheath. *Spores* purple or green, formed within each of the cells of the frond. BANGIA (*Lyngb.*),—in honour of *Hofmann Bang*, a Danish botanist, and friend of *Lyngbye*.

BANGIA *fusco-purpurea*; filaments elongated, simple, decumbent, nearly straight, here and there constricted, forming a brownish-purple, glossy stratum; granules several in each transverse band, dark purple.

BANGIA *fusco-purpurea*, *Lyngb. Hyd. Dan.* p. 83. t. 24. *Grev. Fl. Edin.* p. 302. *Spreng. Syst. Veg.* vol. iv. p. 361. *Grev. Alg. Brit.* p. 177. *Hook. Brit. Fl.* vol. ii. p. 316. *Wyatt, Alg. Danm.* no. 167. *Harv. in Mack. Fl. Hib.* part iii. p. 241. *Harv. Man.* p. 172. *J. Ag. Alg. Medit.* p. 14. *Kütz. Phyc. Gen.* p. 249. *Chauv. Mém. sur Bangia, Recherches*, p. 35.

BANGIA *atro-purpurea*, *Ag. Syst.* p. 76. *Ag. Ic. Alg. Eur.* t. 25. *Endl. 3rd Suppl.* p. 18. *Kütz. Phyc. Gen.* p. 250.

BANGIA *versicolor*, *Kütz. l. c.* p. 250. t. 45. f. 3.

CONFERVA *fusco-purpurea*, *Dillw. Conf.* t. 92. *E. Bot.* t. 2055.

CONFERVA *atro-purpurea*, *Roth. Cat. Bot.* vol. iii. p. 208. t. 6. *Dillw. Conf.* t. 103. *E. Bot.* t. 2085.

HAB. On rocks and planks in the sea, within the tide range (also in fresh-water rivers and canals). Common on the shores of England and Ireland, in many places. Rare in Scotland? Frith of Forth, *Prof. Arnott*. Jersey, *Miss White*.

GEogr. DISTR. Atlantic Shores of Europe, from the Færoe Islands to France. Mediterranean Sea.

DESCR. *Fronde* fixed by their base, aggregated into widely spreading patches, several inches in diameter, capillary, from one to three or four inches in length, decumbent, or floating in the water, very flaccid, glossy and lubricous, some of the threads of much greater thickness than others. *Threads* cylindrical, composed of radiating, obconical cellules disposed in circles round a narrow central tube, and contained within a pellucid sheath; these circles of cells, closely piled on each other, constitute the frond. Each cell contains a dark purple mass of endochrome, which finally is compacted into a spore, and discharged, on the rupture of the parent cell, into the tube.

The genus *Bangia*, founded by *Lyngbye*, in honour of his friend and preceptor in Phycological studies, has, owing to its originally vague definition, been more than usually unfortunate in having intrusive species placed in it; as well as having a great

variety of characters assigned to it by the several authors who have taken it up. Even those who agree in making *B. fusco-purpurea* the typical species, describe its structure very differently; some asserting that this plant is flat, others tubular but plano-compressed, and others cylindrical. That the latter is its true character becomes at once evident, by making a transverse section of a filament, or, as is much more easily done, by cutting a half dry bundle of filaments into short frustules, which, when moistened, will immediately exhibit the circular wheel-like appearance, represented at our fig. 3.

M. Chauvin, in his excellent 'Recherches'*, has entered at great length into the history of this genus, proposed a reformed character, and limited the species to *B. fusco-purpurea* (the type), *B. crispa*, *B. ciliaris*, and *B. elegans*, Chauv., the last-mentioned differing from the others in having a branching frond. *B. Laminariæ* of Lyngbye, is, he assures us, identical with the young state *Asperococcus? pusillus*, Cann., its affinity with which was long since pointed out by Mr. D. Moore. While I admit the near proximity of these plants, I am not yet prepared to unite them. *B? latevirens*, on the same authority, is only the rudimentary state of an *Enteromorpha*; and this I am disposed to allow.

A curious point in the history of *Bangia fusco-purpurea* is, that it is found equally in the sea, and in fresh-water rivers and canals, reaching an equal degree of development and coloration in either situation. Such an indifference is very unusual among the Algæ; but I can perceive no sufficient distinctions between the fresh-water and marine specimens to found a separate species, upon. Prof. Kützing, however, describes the fresh-water form under two names, *B. coccineo-purpurea* and *B. roseo-purpurea*; relying chiefly on the habitat, and some slight difference of colour. I fear these species cannot stand.

* Recherches sur l'organisation, la fructification et la classification de plusieurs genres d'algues, &c.: Caen, 1842.

Fig. 1. *BANGIA FUSCO-PURPUREA*:—*of the natural size*. 2. Portions of filaments:—*magnified*. 3. A transverse section of a filament:—*highly magnified*.



PLATE CCCXXII.

BANGIA CILIARIS, *Carm.*

GEN. CHAR. *Fronde* filiform, tubular, composed (in typical species) of numerous, radiating cellules, disposed in transverse rows, and enclosed within a hyaline, continuous sheath. *Spores* purple or green, one formed within each of the cells of the frond. BANGIA (*Lyngb.*), —in honour of Hoffman Bang, a Danish botanist and friend of Lyngbye.

BANGIA *ciliaris*; filaments gregarious, very minute, simple, straight, compressed, purple; grains two or three in each transverse band, globose, sometimes solitary.

BANGIA *ciliaris*, *Carm. MSS.* *Hook. Br. Fl.* vol. ii. p. 316. *Harv. Man.* ed. 1. p. 172. ed. 2. p. 218. *Chauv. Recherches*, p. 37.

GONIOTRICHUM *ceramicola*, Var. *a. simplex*? *Kütz. Sp. Alg.* p. 358. (*so far as reference to Carm. and Chauv.*)

HAB. On the margins of old leaves of *Zostera marina*. Annual. Spring. Appin, *Capt. Carmichael*.

GEOGR. DISTR. Shores of Scotland, and the north of France.

DESCR. *Filaments* gregarious, about half a line in length, fringing the leaves of *Zostera* in narrow patches one or more inches in length. Each little thread is erect, straight, or slightly curved, variable in diameter, sometimes containing but a single series or row of granules; oftener containing a double row, and now and then a triple row. All these variations of structure sometimes occur in the same plant, in which case one portion is broader than another, and usually it is the middle portion which is distended. The *granules* are roundish, somewhat depressed at the poles, and of a brilliant purple colour.

By much the most minute of the genuine species of *Bangia*, and not very different from what the youngest state of *B. fusco-purpurea* may be supposed to be. I have seen no specimens but those found by Capt. Carmichael, and now deposited in the Hookerian Herbarium, and from one of these our figure and description have been taken. Capt. Carmichael describes it as commonly fringing the leaves of *Zostera* at Appin, and probably it may be found in many places where it has been overlooked, its minute size protecting it from all but a very careful eye.

On the other hand, its bright colour will make it be easily detected, when specially sought for.

By comparing the figure now given with that of *Bangia ceramicola* (Plate CCCXVII.), the differences between these species may readily be seen; differences which preclude us from regarding them as states of the same plant, as Kützing supposes. Possibly that acute author, not having seen any specimen of our British plant, first described by Capt. Carmichael, has mistaken some other plant for it.

Fig. 1. Portion of a leaf of *Zostera marina*, fringed with *BANGIA CILIARIS* :—
the natural size. 2. Fronds of *Bangia ciliaris*, of different diameters :—
highly magnified.

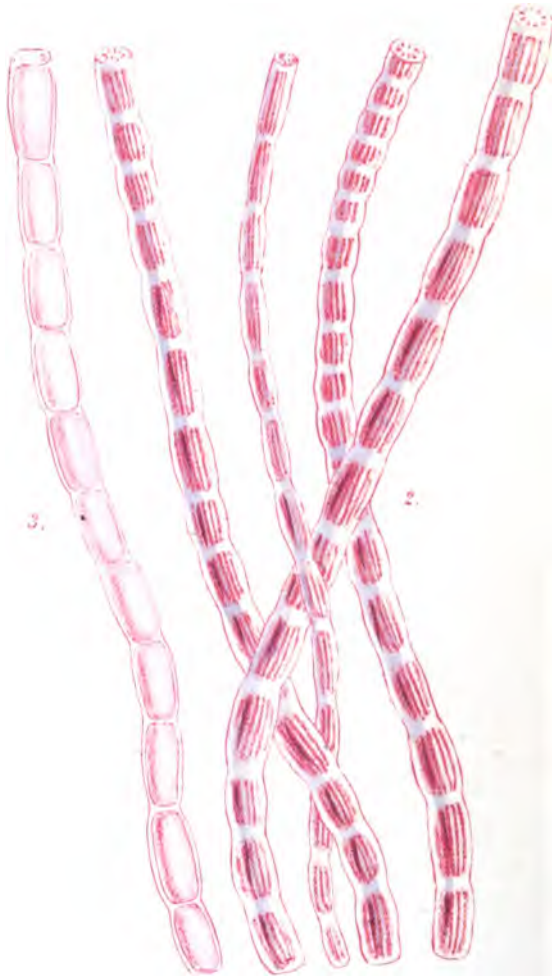


PLATE CCCXVII.

BANGIA? CERAMICOLA, *Chauv.*

GEN. CHAR. *Fronde* filiform, tubular, composed of numerous radiating cells, disposed in transverse rows, and enclosed within a hyaline, continuous sheath. *Spores* purple or green, one formed in each of the cells of the frond. BANGIA (*Lyngb.*),—in honour of Hoffman Bang, a Danish naturalist and friend of Lyngbye.

BANGIA *ceramicola*; filaments parasitical, very slender, flaccid, elongated, rosy; articulations once or twice as long as broad, longitudinally striate; the endochrome "at length globular and escaping through the broken tube." (*Carm.*)

BANGIA *ceramicola*, *Chauv. Recherches, &c.*, p. 29. *Harv. Man.* ed. ii. p. 218.

CERAMIUM *ceramicola*, *Ag. Sp. Alg.* vol. ii. p. 155.

GONIOTRICHUM *ceramicola*, *Kütz. Phyc. Gen.* p. 244. *Sp. Alg.* p. 358. (*Excl. syn. Carm.*)

CONFERVA *ceramicola*, *Lyngb. Hyd. Dan.* p. 144. t. 48. D. *Hook. Br. Fl.* vol. ii. p. 355. *Harv. Man.* ed. i. p. 133.

HAB. Parasitical on the smaller Algæ, in tide-pools. Appin, *Captain Carmichael*. Arran, on *Polysiphonia nigrescens*, *Rev. D. Landsborough*. Torquay, on *Cutleria multifida*, *Mrs. Griffiths*.

GEOGR. DISTR. Shores of Northern Europe.

DESCR. *Filaments* about an inch or an inch and a half in length, attached at base, floating in the water like tufts of fine floss-silk, extremely slender, but not of equal diameter, some filaments being twice as broad as others, unbranched, articulated. *Articulations* either as long as broad, or, more commonly, twice as long, slightly constricted at the dissepiments, the endochrome finely striate longitudinally, and apparently consisting of radiating cellules placed side by side;—but the exact structure not easily seen after the plant has been dried, in which state, only, have I seen it, and I have not succeeded in getting a transverse section. Sometimes (as at fig. 3) the articulations appear empty; the endochrome having escaped. *Colour* a beautiful rosy red. *Substance* delicately membranaceous. In drying, the plant adheres closely to paper.

Our figure is taken from a specimen communicated by the Rev. D. Landsborough, and exhibits the characters of the plant, so far as it is possible to arrive at them from a dried specimen.

I have not been able to ascertain the exact structure:—the radiated appearance shown in the truncated ends of the magnified filaments, is only *inferred* from the striated surface, which the endochrome presents to a high magnifying power. Whether these striæ are caused by shrinking of the membrane in drying, or whether they are really (as I have supposed) the exterior faces of slender radiating cells, cannot be determined without an examination of a fresh specimen.

I have not seen any specimen from Captain Carmichael, and, therefore, am unable to assert the identity of what I now figure with his plant. My specimens* do not show the running together of the endochrome into a sporidium as he describes, and the articulations, though sometimes short, are more usually twice as long as their diameter.

This plant is referred to *Bangia*, at the suggestion of M. Chauvin. I do not think it strictly accords with the proper structure of that genus; but it may remain in that convenient receptacle until its true structure is fully made out. Should it eventually be made the type of a new genus, I fear Kützing's *Goniotrichum* can scarcely be adopted, because he confounds under that name both *Bangia? elegans*, Chauv., and *Bangia ciliaris*, Carm., two very distinct plants, and the latter a true *Bangia*.

Fig. 1. Tufts of BANGIA? CERAMICOLA, growing on an old piece of *P. nigrescens*:—*the natural size*. 2. Portions of four filaments, showing the variations of size and length of joints. 3. An empty filament:—*the two last figures very highly magnified*.

* While this sheet is passing through the press, I have received from Mr. Landsborough a specimen which shows the commencement of the fruiting process described by Carmichael, and in which the articulations are shorter than in the specimen I have figured. I no longer entertain any doubt of the identity of Carmichael's and my plants.

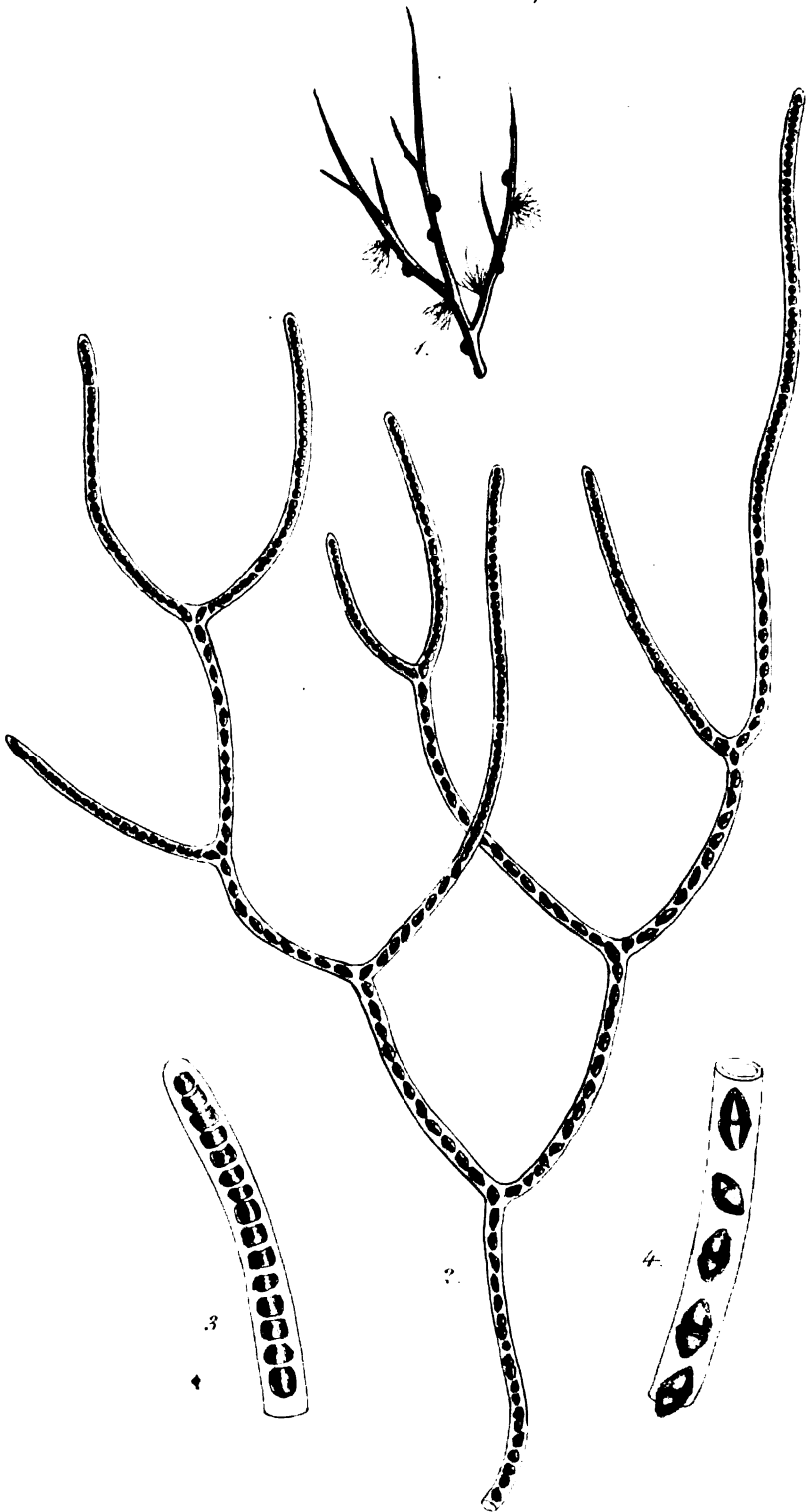


PLATE CCXLVI.

BANGIA (?) ELEGANS, *Chauv.*

GEN. CHAR. *Fronde* filiform, tubular, composed (*in the typical species*) of numerous radiating cellules, disposed in transverse rows and enclosed within a hyaline, continuous sheath. *Spores* purple or green, formed within each of the cells of the frond. BANGIA (*Lyngb.*),—in honour of *H. Bang*, a Danish Botanist, and friend of Lyngbye.

BANGIA? *elegans*; filaments minute, dichotomously branched, with very patent axils; branches containing a single row of simple or binate, purple granular cells.

BANGIA *elegans*, *Chauv. Mem. Soc. Linn. Norm.* vol. vi. p. 13. *Alg. Norm. Fasc.* vii. no. 159. *Recherches*, p. 33.

HAB. Parasitical on the smaller algæ. Very rare. Dredged in Strangford Lough at Portaferry, adhering to *Gracilaria confervoides*, *Wm. Thompson, Esq.* (1838.)

GEOGR. DESCR. Coast of Normandy.

DISTR. Forming minute tufts, 1–2 lines long, resembling, to the naked eye, the tufts of *Callithamnion Davierii* in colour and size. *Filaments* dichotomously branched, several times forked, the branches cylindrical, curved, spreading, with very wide axils, obtuse at the tips. The younger parts of the filament contain a string of closely-set lenticular granules or cells, arranged like those of a *Lyngbya*. In the older parts the cells are less regularly placed and are more distant, of a broadly spindle-like form with a division in the centre, as if composed of two conical or sugar-loaf bodies. These are probably the ripe *spores*, which escape on the bursting of the tubular filament. The colour of the spores is a purplish lake, becoming greenish in decay.

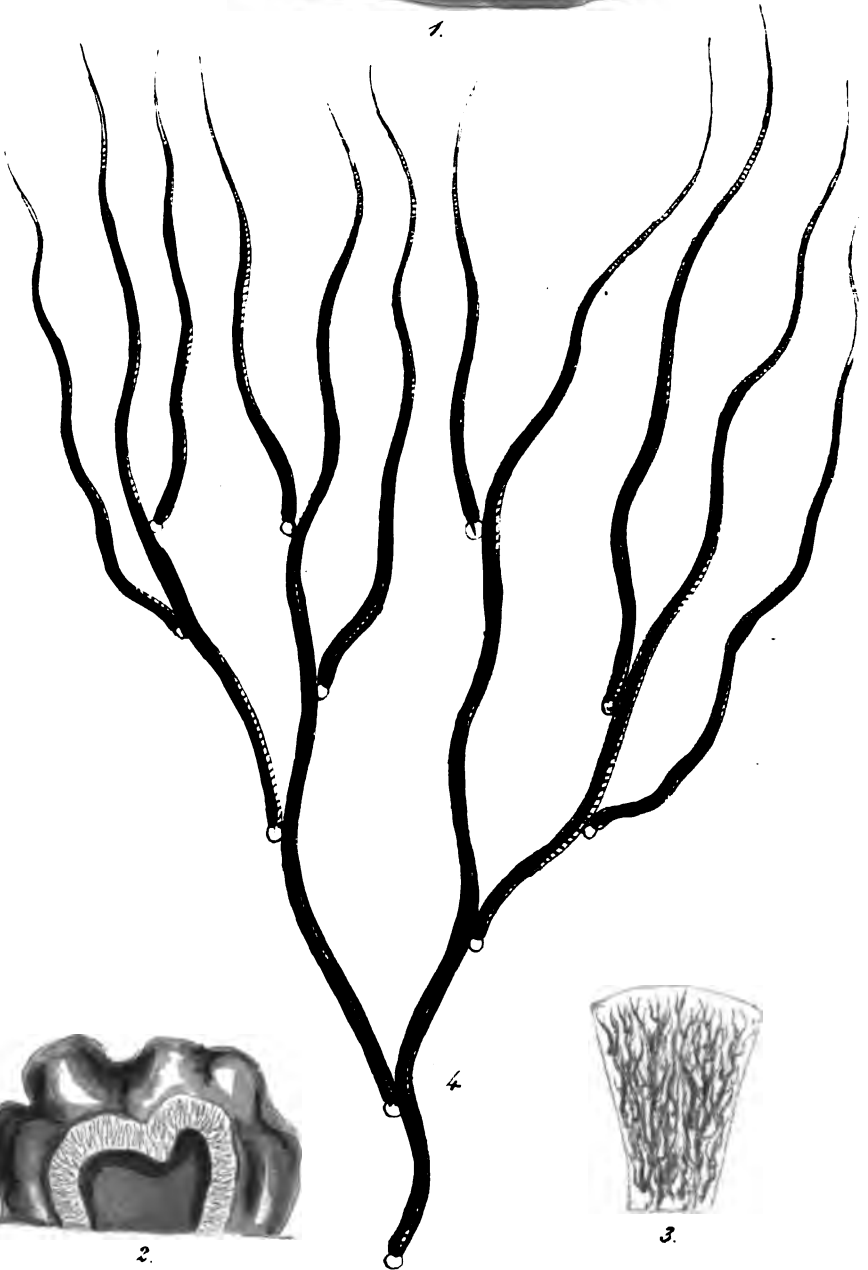
The only British specimen of this curious and beautiful little plant that I have seen, was dredged several years ago by my friend Mr. Thompson, of Belfast, who communicated it to me, and allowed me to retain a portion, from which the figure here given has been prepared. This I have compared with an authentic specimen of Chauvin's plant, received from M. Lenormand, and find them to agree in all essential particulars. The chief difference is in colour, the Irish specimen having lost its original purple and acquired a greenish shade; no uncommon effect of decay.

The genus *Bangia* has long been a receptacle for heterogeneous species, and though partially reformed by M. Chauvin in the excellent memoir above quoted, it can hardly be said that in making the present plant a species of *Bangia* he has more than indicated its near affinities. For though doubtless allied to *Bangia*, its structure is more simple than in the genuine members of the genus, and it stands nearer perhaps to *Sphaeroplea* of Agardh. It might, however, be more properly regarded as the type of a new genus characterized by the binate spores.

Fig. 1. Tufts of *BANGIA ELEGANS*, growing on *GRACILARIA CONFEROIDES*:—
the natural size. 2. A frond, *magnified.* 3. A young apex. 4. A portion
of the older part of the frond:—*highly magnified.*



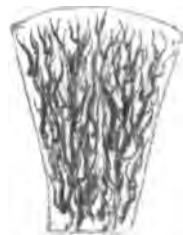
1.



2.



3.



4.

PLATE CCCXV.

RIVULARIA PLICATA, *Carm.* •

GEN. CHAR. *Fronde* globose or lobed, fleshy, firm, composed of continuous, radiating filaments, annulated within and springing from a spherical globule, and surrounded by, or set in, gelatine. *RIVULARIA* (*Roth*), —in allusion to the fluviatile habitat of some of the species.

RIVULARIA plicata; fronds rather large, densely gregarious, gelatinous, compresso-plicate, often hollow and at length ruptured, dark green; filaments wavy, associated in dichotomous series, tapering to a fine point.

RIVULARIA plicata, *Carm. Harv. in Hook. Br. Fl.* vol. ii. p. 392. *Harv. Man.* ed. 2. p. 222.

LICHEN corrugatus, *Dickson!* (*sic Borrer*).

HAB. On the rocky sea-shore, about high-water mark, or in situations only occasionally overflowed by salt water. Appin, *Capt. Carmichael*. Ballintrae, Ayrshire, *Mr. W. Thompson*. Eyrmouth, *Dr. Johnstone*. Torbay, *Mrs. Griffiths*. Innischerig Island, Malbay; and elsewhere, *W.H.H.*

GEOGR. DISTR. — ?

DESCR. *Fronde* densely crowded together, each patch generally occupying a surface of several square inches; variously lobed, and by mutual pressure distorted and compressed, so that the mass has a plaited or warted appearance. When young the fronds are solid and firmly gelatinous; as they advance in age they become hollow, and are at length often ruptured and variously torn. *Filaments* wavy and much attenuated, associated in dichotomous or subdichotomous series, each filament being joined to its fellow by a spherical, pellucid connecting cell, and the whole firmly set in the gelatinous matrix of the frond. *Rings* evident and close. *Colour* a dark, lurid, or blackish green. *Substance* elastic, smooth, and somewhat lubricous. In drying, the plant shrinks considerably, and if subjected to pressure will adhere firmly to paper.

A well-marked species of *Rivularia*, easily recognized and not uncommon on several parts of our shores. It was first noticed by the late Captain Carmichael on the west coast of Scotland. Like *R. nitida*, it becomes hollow in age, but may always be known from that species by its much darker and duller colour, smaller size, and the difference of habitat. The fronds are very irregular in shape, and alter considerably as they advance to

maturity, by the lateral pressure of one frond on another. I cannot say anything to the collector of specimens in praise of the beauty of this production; what it has in that way it keeps concealed, or reserves for microscopic eyes.

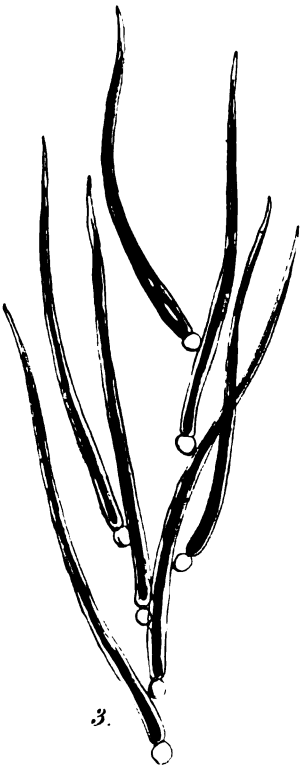
Fig. 1. Cluster of fronds of RIVULARIA PLICATA, on a piece of rock:—*the natural size.* 2. One of the fronds, cut vertically to show the hollow centre. 3. A vertical portion of the gelatine, with imbedded filaments. 4. Some of the filaments removed and pressed asunder:—*the latter figures more or less highly magnified.*



1.



2.



3.



4.

PLATE CCXXXIX.

RIVULARIA ATRA, Roth.

GEN. CHAR. *Fronde* globose or lobed, fleshy, firm, composed of continuous radiating filaments, annulated within, each springing from a spherical globule. RIVULARIA (Roth),—so named by Roth, in allusion to the fluviatile habit of some of the first-discovered species.

RIVULARIA *atra*; fronds minute, scattered, globose, or hemispherical, firm, smooth, glossy black-green; filaments dark green, densely packed.

RIVULARIA *atra*, Roth, *Cat. Bot.* vol. iii. p. 340. *Ag. Syn.* p. 130. *Ag. Syst.* p. 24. *E. Bot.* t. 1798. *Harv. in Hook. Br. Fl.* vol. ii. p. 392. *Harv. in Mack. Fl. Hib.* part 3. p. 235. *Harv. Man.* p. 152.

EUACTIS *atra*, Kütz. *Phyc. Gen.* p. 241.

LINCKIA *atra*, Lyngb. *Hyd. Dan.* p. 195. t. 65.

LINCKIA *hemispherica*, Schum. *Enum.* vol. ii. p. 114.

TREMELLA *hemispherica*, Linn. *Syst. Nat.* vol. ii. p. 714. *Huds. Fl. Ang.* p. 565. *Lightf.* p. 900. *With.* vol. iv. p. 81.

CHÆTOPHORA *atra*, *Ag. Disp.* p. 43.

HAB. On rocks and stones, and on Corallines and other Algæ, between tide marks. Perennial? At all seasons. Very abundant.

GEOGR. DISTR. Shores of Europe.

DESCR. *Fronde* one or two lines in diameter, hemispherical when attached to flat surfaces, globose when growing on filiform Algæ, very hard, of an exceedingly firm, compact substance, and dark colour. *Filaments* subulate, attenuated, connected together in branching, subdichotomous series, filled with dark-green endochrome, which is annularly divided in the upper part, and coheres in oblong masses in the lower. Each filament springs from a transparent globule (or connecting cell).

A very common plant on all rocky shores, growing either on the rocks, or on the smaller Algæ, especially on *Cladophora rupestris* and *Corallina officinalis*. It forms small, hard wart-like balls or hemispheres, rarely as large as the seed of Sweet-Pea (*Lathyrus odoratus*), and sometimes completely covers the plant to which it attaches itself.

Carmichael describes an allied species, *R. applanata*, said to differ from *R. atra* in being flatter and thinner in substance, and growing in similar localities. This I have never seen.

Fig. 1. RIVULARIA ATRA :—*of the natural size.* 2. Vertical section of a frond.
3. Some of the filaments :—*magnified.* 4. A filament separated and *highly magnified.*

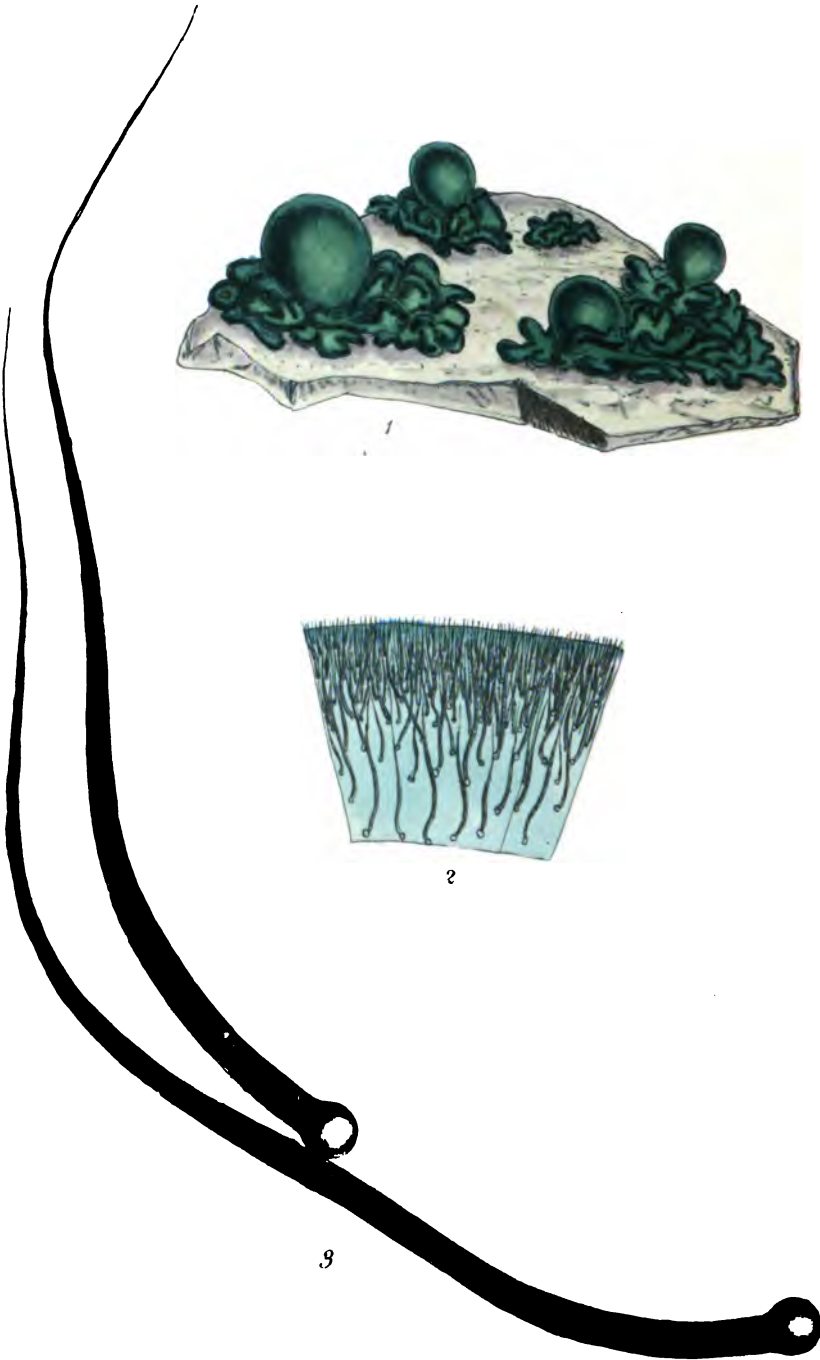
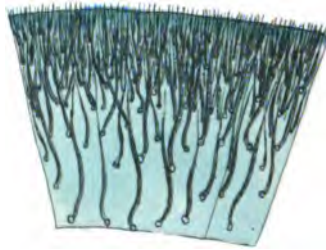
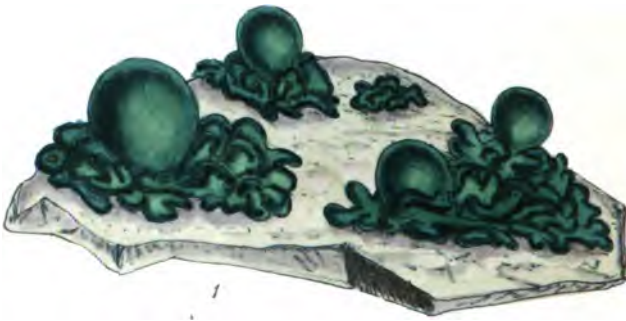


PLATE LXVIII.

RIVULARIA NITIDA, *Ag.*

GEN. CHAR. *Frond* globose or lobed, fleshy, firm, composed of continuous radiating filaments, annulated within, and springing from a spherical globule. RIVULARIA,—so named by Roth, in allusion to the fluviatile habitat of some of the first discovered species.

RIVULARIA *nitida*; frond (large), gelatinoso-coriaceous, lobed and plaited, often bullated, lubricous, shining deep green, filaments simple, very much attenuated.

RIVULARIA *nitida*, *Ag. Syst.* p. 25. *Harv. in Hook. Br. Fl.* vol. ii. p. 393. *Harv. in Mack. Fl. Hib.* part 3. p. 235. *Wyatt, Alg. Danm.* no. 50. *Harv. Man.* p. 152. *Endl. 3rd Suppl.* p. 12.

RIVULARIA *bullata*, *Berk. Gl. Alg.* t. ii. f. 1. *J. Ag. Alg. Medit.* p. 9. *Endl. 3rd Suppl.* p. 13.

SCYTOCHLORIA *nitida*, *Harv. in Hook. Br. Fl.* l. c.

ALCYONIDIUM *bullatum*, *Lamour.*

PHYSACTIS *lobata*, *Kütz. Phyc. Gen.* p. 236. t. 4. f. 5.

HAB. On marine rocks, at half-tide level. Annual. Summer and Autumn. Common on the southern shores of England, and south and west of Ireland.

GEOR. DISTR. Baltic Sea. Atlantic shores of Europe. Mediterranean Sea.

DESCR. *Fronde*, from $\frac{1}{4}$ an inch to an inch or more in diameter, tremelloid, tufted or gregarious, much lobed and sinuated, at first compressed, and filled with solid gelatine; afterwards hollow and inflated. *Substance* very firm and elastic, not easily torn, lubricous and subgelatinous to the touch. *Colour* a deep, but very vivid green. *Filaments* simple or pseudo-branched, wavy, laxly set in the interior of the frond, densely packed towards the surface, tapering to a very long, setaceous point, densely annulated within. *Striæ* very conspicuous.

This is the largest marine species of *Rivularia* on the British shores, ornamenting, at the end of the summer, perfectly barren masses of rock with its bright-green glossy patches. On the western shores of Ireland it is very common as far north as Galway, and perhaps further; but has only, that I am aware of, been observed on the southern shores of England. Yet it inhabits the Baltic Sea. It probably, therefore, exists in many places on our shores, where it has been overlooked.

The genus *Rivularia*, as originally proposed by Roth, con-

tained a very heterogeneous assemblage of plants, including almost every Alga which is outwardly gelatinous, and whose inward structure exhibits a filamentous arrangement. Thus such plants as *Gloiosiphonia* were included in it, as well as the *Chatophoræ*, and many others equally unlike each other. The group to which the name is now restricted, is distinguished by having a gelatinous frond of a definite form, filled with radiating threads, each of which terminates at its lower extremity in a globular cellule. The plants thus associated have a strong affinity together, but are not exclusively marine, several of them inhabiting fresh water, and others growing on moist rocks. Some of the latter have the property of secreting lime in their tissues, if not in such a regular manner as the Corallines, in a manner approaching to it. None of the marine species exhibit this property.

Fig. 1. Patches of RIVULARIA NITIDA :—*the natural size.* 2. Portion of the gelatinous frond. 3. Filaments :—*magnified.*



PLATE CCCXVI.

SCHIZOSIPHON WARRENIÆ, *Casp.*

GEN. CHAR. *Frond* globose or lobed, gelatinous, composed of closely-packed, annulated, radiating, sheathed filaments, each of which springs from a pellucid cell. *Sheath* gelatino-membranous, vertically cleft into innumerable hair-like shreds. SCHIZOSIPHON (*Kütz.*),—from *σχίζω*, to divide, and *σφῆρα*, a tube.

SCHIZOTHRIX *Warreniæ*; “fastigiately branched; the lowest cell of the branches wider, hemispherical, lateral; sheaths dark-coloured, the fibres often spiral; apices of the branches much attenuated.” *Casp.*

SCHIZOSIPHON *Warreniæ*, *Caspary in Ann. and Mag. Nat. Hist.* 3rd series, vol. vi. p. 266. t. 8.

HAB. On rocks at high-water mark, chiefly in places exposed to the dripping of fresh water. Near Mairporth, Falmouth, and at Plymouth, *Dr. Robert Caspary*. Sidmouth, *Rev. R. Cresswell*.

GEOGR. DISTR. — ?

DESCR. “The plant forms a solid crust over the horizontal rock, to the extent of many square feet, in larger or smaller patches, from $\frac{1}{4}$ to $\frac{1}{2}$ inch in thickness, throwing up on the surface little spherical elevations of different diameter and height.” “The colour is, in the fresh state, a dark, dull, blackish-green; in the decayed, a tan-brown, and on the rocks the greater part of the plant is of the latter colour. It feels slimy and slippery.” “The stem and branches are, with the exception of the apices, enveloped in a sheath of brownish-green jelly. This sheath is composed of many funnel-shaped, gelatinous tubes, succeeding each other at little distances; the upper part with its thinner end in the wider of the lower, and surrounding the stem in such a way that this seems to be covered with a solid gelatinous mass. The upper end of each tube is split into a great many hair-like threads of very minute diameter, which frequently curl about in an irregular manner, but often represent a phenomenon very rarely found amongst Algæ, that they form a real spiral round the gelatinous cover of one or two branches, or stems.” “I have watched the plant from the end of February to the beginning of May, without having found any fruit, or having perceived any alteration in its structure.”—*Casp. l. c.* p. 266–268 (*abridged*).

I have copied the specific character and description of this curious plant from Dr. Caspary's account published in a recent number of Taylor's 'Annals of Natural History,' to which I refer

for fuller particulars and a further analysis. In our plate, fig. 3 is a little out of proportion, the sheaths and filaments being too short in proportion to their breadth, a distortion arising from their having been strongly pressed between glasses, for the purpose of separating them. Professor Kützing, who has founded the genus, describes no less than thirty-two species, several of which, probably, may be detected in this country. Whether our *S. Warreniæ* be referable to any of those enumerated, I cannot say, not having had the opportunity of comparing specimens; and being unable to determine the point from the author's short descriptions, in reading over which one is tempted to believe that the thirty-two might well be reduced at least one-half. Be this as it may, the plant now figured was added to our Flora by Dr. Caspary, and has been named by him in honour of Miss Elizabeth B. Warren, of Falmouth, a lady whose researches in natural history amply entitle her to this compliment.

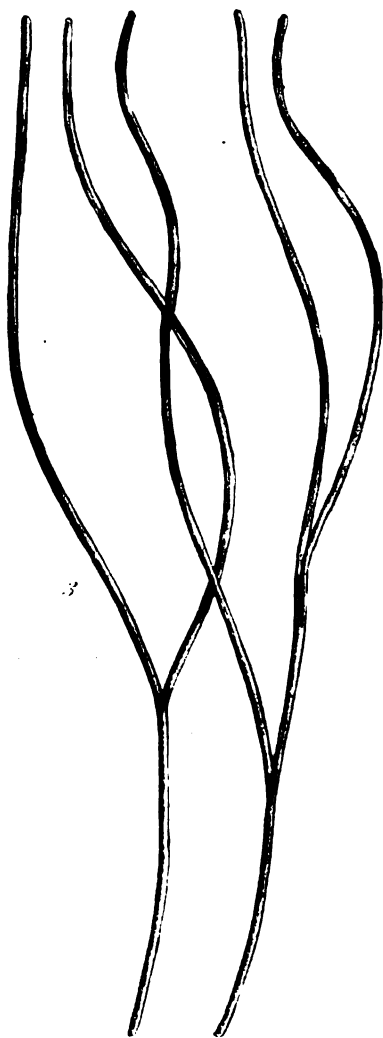
Fig. 1. Cluster of SCHIZOSIPHON WARRENIÆ :—*the natural size*. 2. Sheathed filaments removed and pressed asunder :—*magnified*. 3. Some of the same—*more highly magnified*. 4. Base of filament, with connecting cell :—*highly magnified*.



1.



2.



3.

PLATE CLX.

SCHIZOTHRIX CRESSWELLII, *Harv.*

GEN. CHAR. "*Filaments* involved in a thick, lamellar sheath, rigid, curled, thickened at the base, at length longitudinally divided. *Spermatia* lateral." *Kütz.* SCHIZOTHRIX (*Kütz.*),—from $\sigma\chi\iota\omega$, to divide, and $\theta\rho\iota$, a hair: *hair-splitter*.

SCHIZOTHRIX *Cresswellii*; forming dense, soft, pulvinate, convex tufts; filaments very slender, curved, fastigiata, collected into branching bundles.

SCHIZOTHRIX *Cresswellii*, *Harv. in Herb.* (1846.)

CALOTHRIX *Cresswellii*, *Harv. Phyc. Brit. sub Tab. 76 in not.*

HAB. On sandstone maritime rocks, near high-water mark, exposed to the drip of fresh water. Annual. Winter. Near the Picket rock, Sidmouth, *Rev. R. Cresswell*.

GEOGR. DISTR. South coast of England.

DESCR. *Spreading* over the surface of soft sandstone rocks, in continuous, convex, roundish or oval patches, which run one into another, and cover the rock for spaces several inches in diameter, in a more or less regular manner. *Patches* or tufts one or two inches long, half an inch high (or thick), soft, somewhat slimy, composed of very slender, yellowish or greenish-olive, hyaline filaments, collected into dense, rope-like, branching bundles. *Bundles* fastigiata. *Filaments* exceedingly slender, once or twice divided in a dichotomous manner, apparently by a splitting of the original tube or cell. *Substance* soft, closely adhering to paper, but not glossy when dry. *Colour*, a greenish olive.

In the remarks under Plate LXXVI. of the first volume, I mentioned that I had received from the Rev. R. Cresswell of Salcombe Regis, what I regarded as a new species of *Calothrix*, and proposed to dedicate it to him by the name *Cresswellii*. On communicating a specimen, shortly afterwards, to Professor Kützting, I was informed by that author that it belonged to his recently instituted genus *Schizothrix*, of which it appeared to be a new and very distinct species. This genus is closely related to *Calothrix*, from which it differs chiefly in the mode of increase of its filaments, which divide at maturity in a dichotomous manner. I am not very sure, however, that there may not be some optical delusion in this matter, and offer the third figure in the plate with some hesitation. In habit this plant bears considerable

resemblance to one of the larger species of *Rivularia*, especially to some of the fresh-water kinds, or those that inhabit dripping rocks: localities very similar to what our *Schizothrix* delights in. But the nature of its filaments, the absence of the basal globule, and of the firm gelatinous matrix, afford sufficient characters to separate it from any of the *Rivulariæ*.

Mr. Cresswell states that the *Schizothrix* grows at the very top of high-water mark, in situations where it is exposed to the continual drip of fresh water falling from high mural cliffs, and that it is most luxuriant where the drip falls from the greatest height, which in the station observed is about fifty feet. In this locality, where only this curious plant has yet been found, it occurs in considerable quantity, extending for upwards of twenty yards along the surface of a projecting piece of the cliff. It commences to grow late in the autumn, and is in perfection in November.

I have peculiar pleasure in dedicating this species to its discoverer, who has explored with much zeal and ability the botany of his neighbourhood, not omitting the more minute Algæ, which too commonly escape the notice of mere collectors. I am indebted to him for many specimens of the rarer kinds, and for excellent observations on several of them; and we may anticipate much interesting information from experiments which he has commenced on the growth of Sea-weeds, in closed bottles of sea-water. Already, he writes in a recent letter, he has succeeded perfectly with *Bryopsis plumosa*, which, in the space of a month, "has grown considerably, and is now putting out beautiful side branches." This subject deserves more attention. I may mention that I have myself a plant of *Griffithsia setacea*, inclosed in April 1846, which is now (Feb. 1848) in perfect health; that the water in the bottle has never been changed, and is as pure as when the plant was inclosed in it. No care has been taken of this plant, which stands on a library shelf.

Fig. 1. SCHIZOTHRIX CRESSWELLII; tufts, *in situ*:—of the natural size. 2. Bundles of filaments:—magnified. 3. Portion of two filaments:—highly magnified.

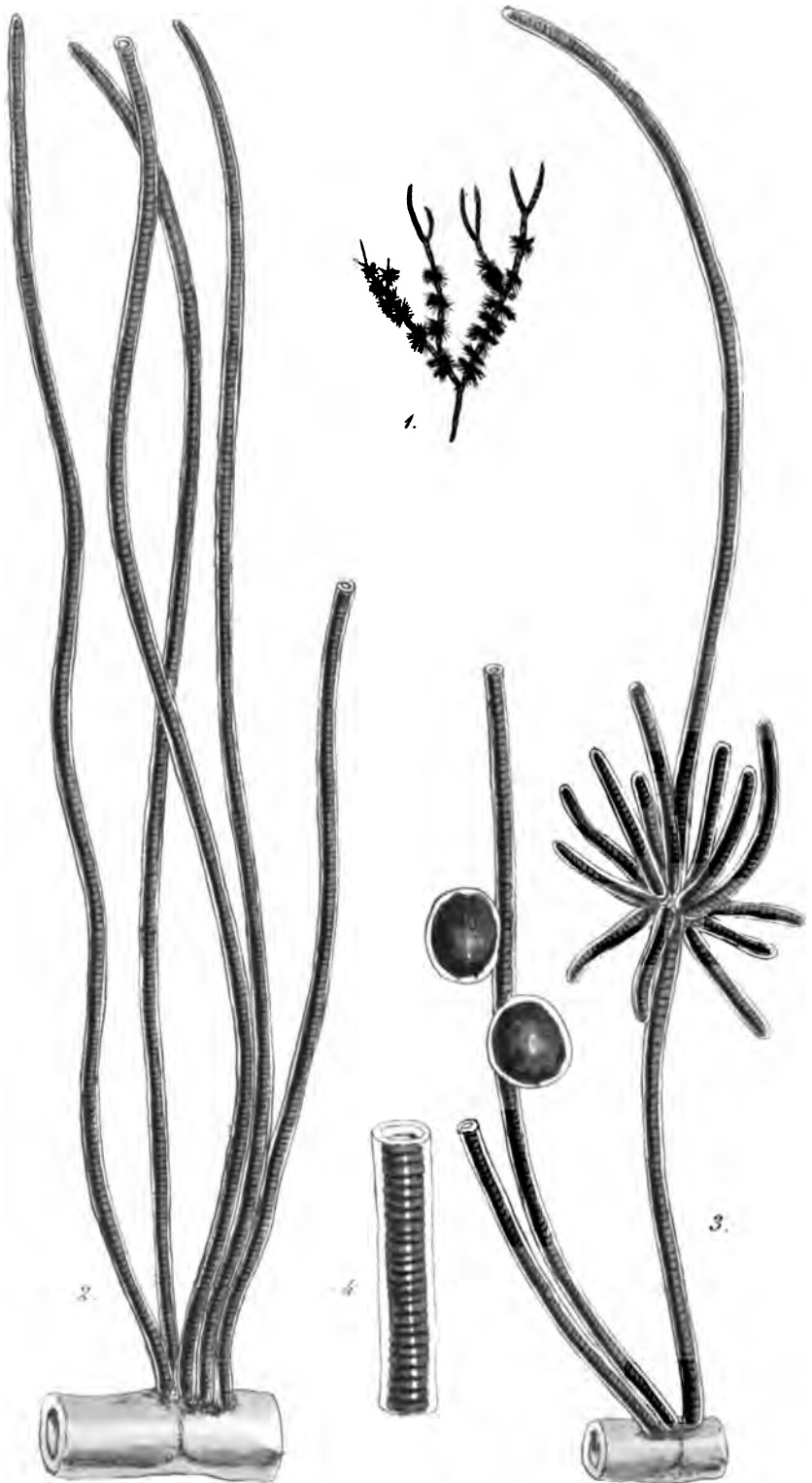


PLATE CCLIV.

CALOTHRIX CONFERVICOLA, *Ag.*

GEN. CHAR. *Filaments* destitute of mucous layer, erect, tufted, or aggregated, fixed at the base, somewhat rigid, not oscillating. *Tube* continuous; endochrome green, densely annulated, at length dissolving into lenticular sporidia. CALOTHRIX (*Ag.*),—from *καλος*, *beautiful*, and *θρίξ*, *a hair*.

CALOTHRIX *confervicola*; filaments short, glaucous, opaque, filiform, blunt, rigid, straight or slightly curved, tufted.

CALOTHRIX *confervicola*, *Ag. Syst.* p. 70. *Harv. in Hook. Br. Fl.* vol. ii. p. 367. *Harv. in Mack. Fl. Hib.* part 3. p. 237. *Harv. Man.* p. 156. *Wyatt, Alg. Damn. No.* 229.

LEIBLEINIA *confervicola*, *Endl. Gen. No.* 57. *3rd Suppl.* p. 21.

LEIBLEINIA *purpurea*, *chalybea* et *æruginea*? *Kütz. Phyc. Gen.* p. 221.

OSCILLATORIA *confervicola*, *Ag. Syn.* p. 110. *Lyngb. Hyd. Dan.* p. 94.

CONFERVA *confervicola*, *Dillw. Conf. t.* 8. *Roth, Cat. Bot.* vol. iii. p. 193. *Fl. Dan.* t. 1484. f. 1. *E. Bot. t.* 2576.

HAB. On small Algæ, between tide-marks; very common. Annual. Summer and autumn.

GEOG. DISTR. Shores of Europe and North America.

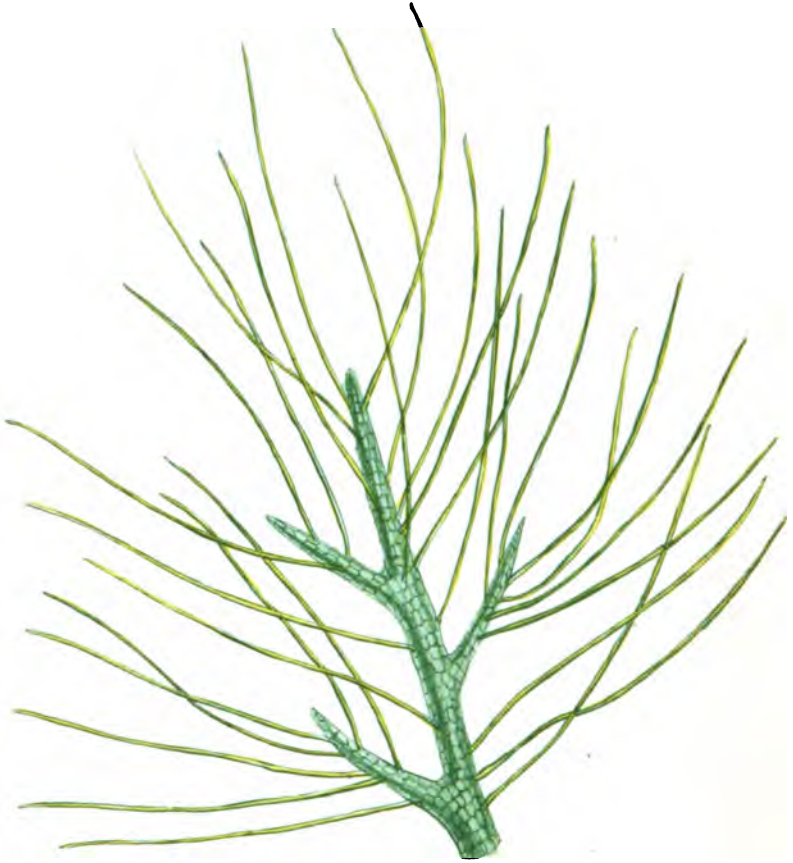
DESCR. *Filaments* densely tufted, somewhat stellate, a line or two in length, filiform, slightly tapering upwards, straight or slightly curved, not twisted, rigid, free or slightly connected together by the edges towards the base, unbranched or sometimes throwing out from the centre of the filament a fascicle of short ramuli, seemingly a proliferous evolution of the endochrome. Now and then, but rarely, roundish bodies, resembling conceptacles (represented at fig. 3) are found attached to the sides of the filaments: their exact nature is not determined. *Endochrome* very dense, of a dark green-colour, reflecting glaucous tints from the surface, closely annulated.

Very abundant on the smaller algæ towards the end of summer, especially on *Ceramium rubrum*, whose fronds are sometimes completely hidden beneath the dense, dark-green pile, formed by this parasite. Such specimens have somewhat the habit of a *Cladostephus*, so densely and equally covered are they. Under water they reflect glaucous tints.

I have ventured to figure globular bodies, which I never saw

but once, though I have repeatedly sought for them. They were originally noticed many years ago by Sir W. J. Hooker, and figured from his drawing, in one of the supplementary plates of Dillwyn's *Confervæ*, and on the faith of that figure the plant has been erected into a genus by Bory,—a measure sanctioned by Endlicher,—and placed in the neighbourhood of *Ectocarpus*. Whatever the nature of these bodies may be, I think that this little plant can scarcely be removed from its congeners without violence; and certainly am unwilling to admit a relationship to *Ectocarpus*. The spore-like bodies may be of the nature of buds, or excrescences, and may possibly be afterwards changed into the tufted ramuli, which are frequently found, as it were, bursting from the sides of the filament.

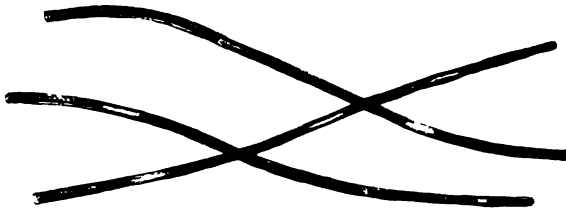
Fig. 1. CALOTHEIX CONFERVICOLA, growing on *Ceramium rubrum*.—*the natural size*. 2. Portion of a fascicle. 3. A proliferous filament; and portion of filament with supposed spores. 4. More highly magnified segment of filament:—*magnified*.



2.



1.



3.

PLATE CCCXLII.

CALOTHRIX LUTEOLA, *Grev.*

GEN. CHAR. *Filaments* destitute of a mucous layer, erect, tufted or aggregated, fixed at the base, somewhat rigid, not oscillating. *Tube* continuous; endochrome green, densely annulated, at length dissolved into lenticular sporidia. CALOTHRIX (*Ag.*),—from *καλος*, *beautiful*, and *θριξ*, a *hair*.

CALOTHRIX *luteola*; filaments scattered, exceedingly minute and slender, filiform, flexible, obtuse, hyaline and pale yellowish, or containing an opake light green, interrupted, faintly annulated endochrome.

CALOTHRIX *luteola*, *Grev. Crypt. Fl.* t. 299. *Harv. in Hook. Br. Fl.* vol. ii. p. 367. *Harv. Man.* ed. 1. p. 157. ed. 2. p. 224.

CALOTHRIX *melaleuca*, *Carm. Alg. Appin. MSS.*

LEIBLEINIA *luteola*, *Kütz. Sp. Alg.* p. 276.

HAB. On marine, filiform *Algæ*, in tide-pools. Appin, *Capt. Carmichael*.

GEOGR. DISTR. —? Helgoland, *Kütz.*

DESCR. *Filaments* of microscopic size, visible to the eye as a minute byssoïd coating to small *Algæ*, when seen under water, but invisible when the affected plant is lifted into the air; scattered, each thread standing apart, of equal diameter throughout, obtuse, very slender, flexible, quite simple, either hyaline and pale yellowish, or more or less filled with an opake, annulated, light-green mass. The whole plant is so minute that it requires the highest powers of a compound microscope to make out its structure.

Our figure has unfortunately been printed in too green an ink, and is less characteristic than I could wish; and will not bear a favourable comparison with the beautiful figure given by Dr. Greville. In one respect, however, I am unable to see this microscopic plant either as Dr. Greville or as Capt. Carmichael has described it, and yet we have all three had the same specimens before us. By Carmichael, its discoverer, it is thus described:—" *Filaments* in small tufts, a line or two in length, exceedingly slender, tortuous, tapering, of a snow-white colour, and so opake as to appear intensely black when viewed against

the light." The same specimens are described by Greville thus :—
"Filaments *hyaline, yellowish*, exceedingly slender, elongated,
flexible, scattered," "neither fasciculate nor tufted." Thus what
Carmichael sees *opaque* and *snow-white*, Dr. Greville describes as
hyaline and *yellowish*. If we further contrast the words of the
several descriptions, other as striking discrepancies will be seen.
So that, had I not received authentic specimens of the original
plant, named by Carmichael himself, I should not have hesitated
to regard his description as drawn from another species; I can
now only attribute the differences to a defective microscope. It
should be stated, however, that I have only seen this plant in a
dried state, when its colour may have altered from *white* to *green*.
Under the higher powers of the microscope the *green* endochrome
(of the dried specimen) is very obvious; the "yellow and 'hya-
line" character mentioned by Greville, has reference to the
empty tube, from which the colouring matter has been dis-
charged. I have only seen Carmichael's specimen, but as he
found it abundantly at Appin, it is probably still to be met with
on that coast, and is worth looking after.

Fig. 1. Small fragment of ENTEROMORPHA CLATHRATA, with CALOTHRIX LUTEOLA infesting it:—*the natural size*. 2. The same:—*highly magnified*.
3. Portions of threads of the *Calothrix*:—*more highly magnified*.

A.



B.



PLATE LVIII. A.

CALOTHRIX FASCICULATA, *Ag.*

GEN. CHAR. *Filaments* destitute of a mucous layer, erect, tufted, or aggregated, fixed at the base, somewhat rigid, not oscillating. *Tube* continuous; endochrome green, densely annulated, at length dissolving into lenticular *sporidia*. CALOTHRIX (*Ag.*)—from *καλός*, beautiful, and *θρίξ*, a hair.

CALOTHRIX *fasciculata*; stratum velvety, dark green, of indefinite extent; filaments very straight, subulate, much attenuated, fasciculately pseudo-branched.

CALOTHRIX *fasciculata*, *Ag. Syst.* p. 71 (*excl. syn.*). *Harv. in Hook. Br. Fl.* vol. ii. p. 368. *Harv. in Mack. Fl. Hib.* part 3. p. 237. *Harv. Man.* p. 158.

HAB. Spreading over the surface of marine rocks, about half-tide level; probably common. Annual? Found at all seasons. Miltown Malbay, *W. H. H.*

GEOR. DISTR. Baltic Sea. British Islands.

DESCR. *Stratum* of indefinite extent, from a few inches to several feet in diameter, of a dark, shining green colour. *Filaments* from two to three lines in height, tufted, erect, straight, tapering to a long, setaceous, pellucid point. In an early stage of growth they are quite simple, and sometimes remain so, but more generally they are furnished with from two to six or more, erect, closely pressed pseudo-branches. *Striæ* or *annuli* strongly marked, and closely set. *Colour* under the microscope, a deep, glaucous green.

This is nearly related to *C. scopulorum*, which I have therefore figured on the same plate; and I am by no means sure that it should not be considered as merely a more developed form of that plant, the differences being occasioned by its growing at a greater depth, and in places where it is more constantly submerged. The filaments are taller, straighter, more acuminate, and of a deeper green than in *C. scopulorum*, and very frequently are furnished with tufts of accessory branches, but this is a character of minor importance.

The genus *Calothrix*, as defined by Agardh, contains many species, the majority of which, as of the *Oscillatorieæ* in general, are found in fresh water. By Kützing this genus has been broken up into several, and formed into a distinct family, an innovation of very questionable character, productive of a host of new synonymes.

4. Fig. 1. CALOTHRIX FASCICULATA. Portion of the stratum:—*the natural size.* 2. A tuft of filaments. 3. Apex of a filament:—*magnified.*

PLATE LVIII. B.

CALOTHRIX SCOPULORUM, *Ag.*

CALOTHRIX *scopulorum*; stratum velvety, dirty green, of indefinite extent; filaments flexuous, subulate, sub-attenuated, simple.

CALOTHRIX *scopulorum*, *Ag. Syst.* p. 70. *Harv. in Hook. Br. Fl.* vol. ii. p. 368. *Harv. in Mack. Fl. Hib.* part 3. p. 237. *Harv. Man.* p. 157.

OSCILLATORIA *scopulorum*, *Ag. Syn.* p. 111. *Hook. Fl. Scot.* part 2. p. 79. *Greav. Fl. Edin.* p. 304.

CONFERVA *scopulorum*, *Web. et Mohr, Reis.* p. 195. t. 3. f. a, b. *Roth. Cat. Bot.* vol. iii. p. 191. *Dillw. Conf. Introd.* p. 39. *Suppl. t. A. E. Bot.* t. 2171.

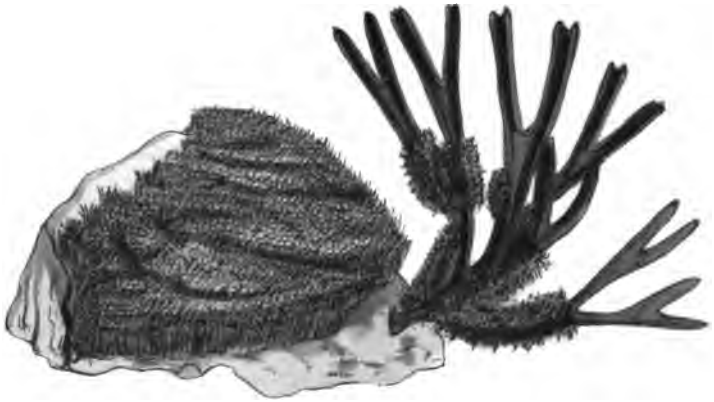
HAB. On marine rocks, near high water mark. Common.

GEogr. DISTR. Shores of Europe; and probably dispersed throughout the temperate zones.

DESCR. *Stratum* of indefinite extent, dark, dirty green, slippery. *Filaments* a line in height, flexuous, often very much curled, subulate, tapering to a more or less acute point, crowded, tufted, the tufts glued together at the base by a slimy matter, simple. *Striæ* sometimes indistinct; sometimes well-defined and very close. *Colour*, under the microscope, a dull, yellowish green.

This forms slimy patches, very treacherous to unwary feet, on the surface of rocks near high-water mark, often growing in places where it is only wet by the splashing of the sea, or only covered at spring tides, and where it is much within the influence of rain. It is found on all our shores, on rocks of every geological character indifferently, and is probably to be met with in similar situations all over the world. It was first detected in Sweden, by Weber and Mohr, and introduced to the notice of British botanists by Mr. Dillwyn.

B. Fig. 1. CALOTHRIX SCOPULORUM. Portion of the stratum:—*the natural size.*
2. A tuft of filaments. 3. Apex of a filament:—*both magnified.*



1



2



3



4

PLATE LXXVI.

CALOTHRIX PANNOSA, *Ag.*

GEN. CHAR. *Filaments* destitute of a mucous layer, erect, tufted or aggregated, fixed at the base, somewhat rigid, not oscillating. *Tube* continuous; endochrome green, densely annulated, at length dissolving into lenticular sporidia. CALOTHRIX (*Ag.*),—from *καλός*, *beautiful*, and *θρίξ*, *hair*.

CALOTHRIX *pannosa*; filaments elongate, rigid, very much curled and twisted, obtuse, densely interwoven together into lamellated tufts or honey-combed strata; endochrome blackish green, densely annulated.

CALOTHRIX *pannosa*, *Ag.* in *Bot. Zeit.* vol. x. p. 635. no. 42. *Endl.* 3rd *Suppl.* p. 13.

CALOTHRIX *lamellata*, *Harv.* in *Herb.* 1842.

HAB. Near high-water mark, growing either on rocks, on *Fucus canaliculatus*, or on *Corallina officinalis*, &c. Perennial. Kilkee, *W. H. H.* Roundstone Bay, *Mr. Mc' Calla.* Sidmouth, *Rev. R. Cresswell.*

GEOGR. DISTR. Adriatic Sea, at Trieste, *C. Agardh.*

DESCR. *Filaments* rigid, from a quarter to half an inch in length, very much curled, equal in diameter throughout, obtuse, very densely and intricately woven together, forming thin laminae, which are either packed together in an irregular stratum with a bristling surface, or arranged with some regularity in a manner resembling honey-comb, small roundish or angular spaces being left between the laminae, which unite at the edges in a sort of net-work. According to the object on which it grows, the plant varies; that on the rock being more regularly honey-combed, and also more luxuriant than that which grows on Algae. *Endochrome* dark green, closely annulated with strongly marked striæ.

I first observed this species at Kilkee, in the spring of 1842, growing on *Corallina officinalis*, in rock pools near high water mark, a situation occasionally selected by the Coralline, but where it seldom reaches perfection. Believing at the time that my specimens belonged to an undescribed species, I communicated them to several friends under the manuscript name, *C. lamellata*. More recently I was pleased at receiving the same plant from the Rev. Mr. Cresswell, of Sidmouth; and last summer, when at Roundstone, Mr. Mc' Calla pointed out to me a locality in which it grows in great abundance and perfection, spreading over every

object which comes in its way. From some of the latter specimens our figure has been taken.

It obviously differs in many characters, from any British species, but I am not prepared to say that it agrees with Agardh's plant gathered at Trieste. Of the latter I have seen no specimen, and form my judgment merely on the short description given by Agardh in the 'Bot. Zeitung', which completely answers to our plant. A comparison with authentic specimens would be very desirable.

From Mr. Cresswell I have also received another new *Calothrix*, having many characters in common with *C. pannosa*, but occurring in cushion-like, soft, fastigiate tufts, and with filaments very much more slender and hyaline than in that species. This last I propose to call *C. Cresswellii*, and to figure in a future number of this work.

Fig. 1. CALOTHRIX PANNOSA :—*the natural size*, growing partly on a piece of rock, partly on *Fucus canaliculatus*. 2. Part of the stratum :—*slightly magnified*, to show the honey-combed surface. 3. Filaments, twisted together. 4. Portion of a filament :—*highly magnified*.



1.



2.



3.

PLATE CCCIX.

CALOTHRIX SEMIPLENA, *Ag.*

GEN. CHAR. *Filaments* destitute of a mucous layer, erect, tufted or aggregated, fixed at the base, somewhat rigid, not oscillating. *Tube* continuous; endochrome green, densely annulated, at length dissolved into lenticular sporidia. CALOTHRIX (*Ag.*),—from *καλος*, beautiful, and *τριξ*, a hair.

CALOTHRIX *semiplena*; filaments long, slender, tough, flexuous, densely interwoven into lamellated tufts; endochrome glaucous green, frequently interrupted, leaving parts of the tube empty.

CALOTHRIX *semiplena*, *Ag. Bot. Zeit.* 1827, No. 40.

CALOTHRIX *lamellata*, *Harv. in Herb.* 1844! (*excl. spec. from Roundstone*).

LYNGBYA *semiplena*, *J. Ag. Alg. Medit.* p. 11.

LYNGBYA *lutescens*, *Lieb. (fide Kütz.)*

LEIBLEINIA *semiplena*, *Kütz. Phyc. Gen.* p. 221. *Sp. Alg.* p. 278.

HAB. In rock-pools near high-water mark, growing on *Corallina officinalis* and other small algæ. Kilkee, *W. H. H. Sidmouth, Rev. R. Cresswell*.

GEOGR. DISTR. The Mediterranean and Adriatic Seas, *Agardh*. Shores of Norway, *Areschoug*! (*Alg. Scand.* No. 8! growing with *Callithamnion Rothii*). Cherbourg, *Lenormand* (as *C. pulvinata*? *Ag.*)

DESCR. *Filaments* from half an inch to an inch or more in length, very slender, simple, waved and gently curved, but not curling, cohering firmly together in flattened bundles or tufts, which often expand laterally into laminae, which are broad below, and gradually narrowed upwards, standing erect, and frequently pointed. These laminae are sometimes loosely bundled together; at other times they are closely heaped, one on the other. The endochrome is dense, of a glaucous or verdegris green colour, and is frequently interrupted, leaving long spaces of colourless tube between each frustum of endochrome. The apices of the filaments are blunt. *Substance* membranaceous, but tough, adhering to paper in drying.

I have to apologize to the readers of the 'Phycologia' for having, under Pl. LXXVI. (*Calothrix pannosa*), confounded the plant now figured with a very different species. The confusion is, however, fortunately limited to the remarks under the description, and to the habitats given;—for the figure, and the whole

description, belong to *C. pannosa*, or at least to the Roundstone plant so named. I am indebted to my friend Mr. Thwaites, for suggesting that our plant (*C. lamellata*, MS.) might be the *C. semiplena* of Agardh, and, though I have seen no authentic specimen, I have little doubt that this is so. At least, the specimen in my copy of Areschoug's 'Algæ Scandinaviæ,' which is quoted by Kützing under his *Leibleinia semiplena*, seems identical with our Irish specimens here figured, but is less luxuriant. The species would appear to have a wide range, both in the warmer and colder seas of Europe. Specimens from Cherbourg, communicated by *M. Lenormand*, doubtfully marked *C. pulvinata*? Ag., are very similar to those from the opposite shores of England.

Fig. 1. CALOTHRIX SEMIPLENA, a mass of laminated tufts:—*the natural size*.
2. Filaments from the same:—*magnified*. 3. Portions of filaments:—*more highly magnified*.



1.



2.



3.



4.

PLATE CCCVI.

CALOTHRIX HYDNOIDES, *Carm.*

GEN. CHAR. *Filaments* destitute of a mucous layer, erect, tufted or aggregated, fixed at the base, somewhat rigid, not oscillating. *Tube* continuous; endochrome green, densely annulated, at length dissolved into lenticular sporidia. CALOTHRIX (*Ag.*),—from *καλος*, *beautiful*, and *θριξ*, a *hair*.

CALOTHRIX *hydroides*; patches widely spreading, flattish, dark olive-green; filaments elongated, flexuous, cylindrical, obtuse, interwoven below, their tips cohering in rigid, erect, tooth-like bundles; border of the filament wide, pellucid.

CALOTHRIX *hydroides*, *Carm. in Hook. Br. Fl.* vol. ii. p. 369. *Harv. Man.* ed. 2. p. 225.

SCYTONEMA *hydroides*, *Carm. Alga Appinenses*, MSS. cum icone.

SYMPLOCA *hydroides*, *Kg. Sp. Alg.* p. 272.

HAB. On the clayey sea-shore, near high-water mark. Appin, *Capt. Carmichael*. Near Queenstown, Cork Harbour, and various other places, *W. H. H. Sidmouth, Rev. R. Cresswell*.

GEOG. DIST. Channel coast of France, *M. Lenormand*.

DESCR. *Patches* spreading over the mud, covering spaces one to two or three or more inches in diameter, sometimes widely spreading, and commonly circular, bristling all over with rigid, erect, close-set but not confounded, tooth-like bundles of filaments, resembling the teeth of a *Hydnum*. *Filaments* composing the patch at first decumbent, spreading over the mud from a common centre, and interwoven together in a thin stratum, their points curved upwards, and strongly glued together in the tooth-like bundles;—each filament with a wide, yellowish, pellucid border, and a dark green endochrome, with subdistant, strongly-marked striæ. The filaments are what is called spuriously branched; that is, small filaments, resembling branches, adhere to the sides of longer ones, as shown in Fig. 4.

A well marked and easily recognized species, first noticed by the late Capt. Carmichael on the muddy sea-shore near Appin. He found it forming small patches an inch or two across, bristling over with small points like the teeth of a *Hydnum*, and this appears to be its usual habit when growing in mud.

found on rocks the patches are often of much greater extent, spreading over the surface for many feet, when the plant may be compared to pieces of rough, dark-green plush. There is always a peculiarly rigid, harsh feel by which this plant may be distinguished from *C. scopulorum*. From *C. pannosa* it differs in its shorter filaments, and the more tooth-like bundles into which they are aggregated.

Fig. 1. Patch of CALOTHRIX HYDNOIDES :—*the natural size*. 2. Tooth-like fascicles, from the same :—*slightly magnified*. 3 and 4. Filaments, and apices of the same :—*more highly magnified*.



1.



2.



3.



4.

PLATE CCCV.

CALOTHRIX CÆSPITULA, *Harv.*

GEN. CHAR. *Filaments* destitute of a mucous layer, erect, tufted or aggregated, fixed at the base, somewhat rigid, not oscillating. *Tube* continuous; endochrome green, densely annulated, at length dissolved into lenticular sporidia. CALOTHRIX (*Ag.*),—from *καλος*, *beautiful*, and *θριξ*, a *hair*.

CALOTHRIX *cæspitula*; filaments forming close, convex, blackish-green tufts, densely packed, flexuous, flaccid, obtuse, not attenuated, here and there spuriously branched: border of the filaments narrow.

CALOTHRIX *cæspitula*, *Harv. in Hook. Br. Fl.* vol. ii. p. 369. *Harv. in Mack. Fl. Hib.* part 3. p. 237. *Harv. Man. ed. 2.* p. 225.

LEIBLEINIA *cæspitula*, *Kg. Sp. Alg.* p. 278.

HAB. Marine rocks, near high-water mark. Annual? Summer. Miltown Malbay, 1831. (*W.H.H.*)

GEOGR. DISTR. —? Adriatic (*Kützting*).

DESCR. *Tufts* very convex, from a quarter inch to an inch and a half in diameter, hemispherical or irregular in outline, deep blackish-green, flaccid, yielding to the touch, growing either on the naked rock or on corallines, shells, &c. *Filaments* densely packed together, often twisted round each other in small bundles, either simple or appositionally branched, obtuse, cylindrical, not tapering to either end; branches erect. *Endochrome* dense, filling the tube; the *strizæ* dense and strongly marked; border narrow.

I can say but little respecting this species, although I am responsible for having originally given it a name. The specimens gathered by me in 1831,—from one of which, assisted by a sketch made at the time from the fresh plant, the plate now given has been prepared,—were collected in rock pools of salt water into which the sea only flows at spring tides, situated at the extremity of "Spanish Point," Miltown Malbay. I have repeatedly sought for the plant on subsequent visits to the west coast, but never successfully, nor have I received specimens from any correspondent. The only continental author who has

noticed this plant is Kützing, who describes what he regards as the same from the shores of the Adriatic, but it would be satisfactory to have specimens from each locality compared together before deciding on their identity.

Fig. 1. Tufts of *CALOTHRIX CÆSPITULA*, growing on a piece of rock:—*the natural size*. 2. Portion of the tuft. 3. Part of the same, more separated:—*both magnified*. 4. Filaments:—*more highly magnified*.

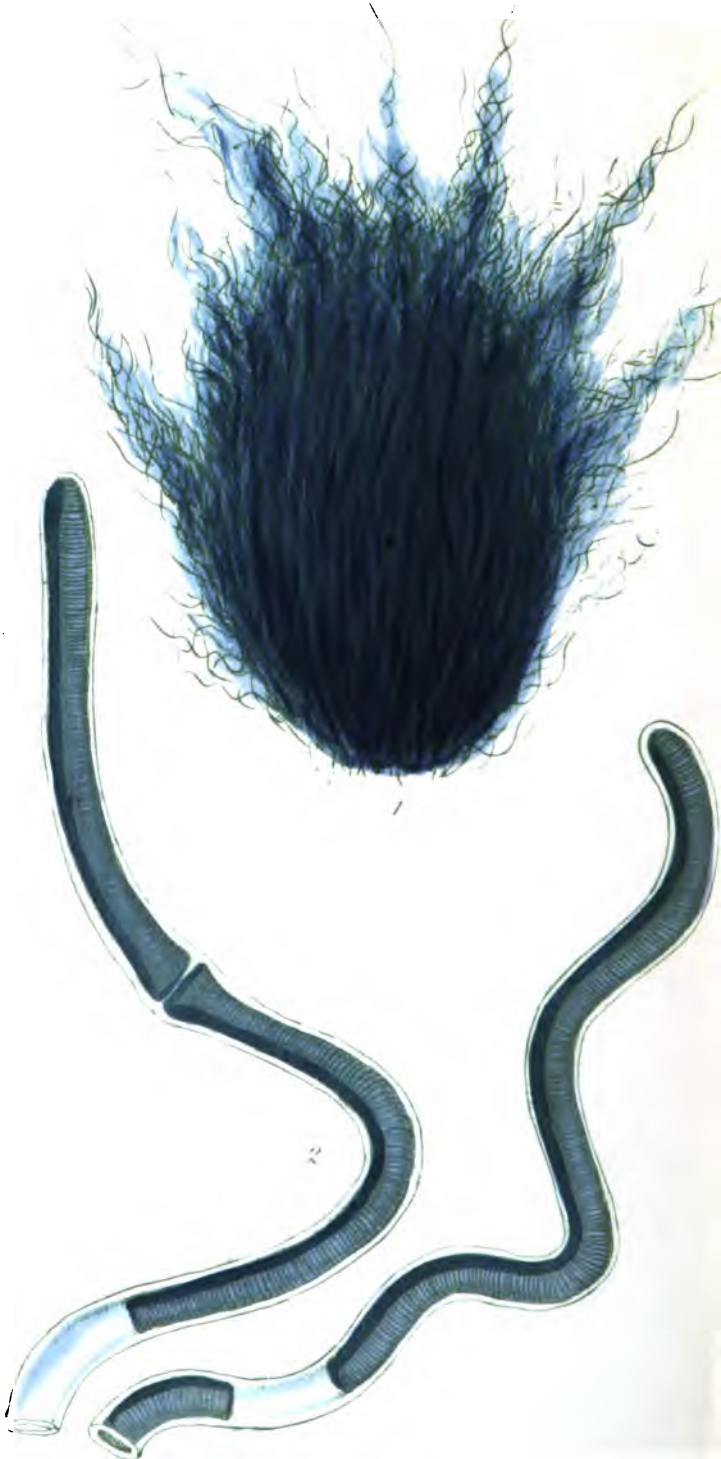


PLATE LXII.

LYNGBYA MAJUSCULA, *Harv.*

GEN. CHAR. *Filaments* destitute of a mucous layer, free, flexible, elongated, decumbent, not oscillating. *Tube* continuous; endochrome green or purple, densely annulated, and finally separating into lenticular *sporidia*. LYNGBYA (*Ag.*) in honour of *Hans Christian Lyngbye*, author of an excellent work on the Algæ of Denmark.

LYNGBYA *majuscula*; tufts of large size; filaments very thick, issuing in long, crisped bundles, from a blackish-green stratum, twisted, simple or slightly pseudo-branched.

LYNGBYA *majuscula*, *Harv. in Hook. Br. Fl.* vol. ii. p. 370. *Harv. in Mack. Fl. Hib.* part. 3. p. 238. *Wyatt, Alg. Danm.* no. 147. *Harv. Man.* p. 160.

LYNGBYA *crispa*, *Ag. Syst.* p. 74 (*in part*).

CONFERVA *majuscula*, *Dillw. Conf. Suppl.* t. A.

HAB. On mud-covered, or sand-covered rocks in the sea, at and below half-tide level; thrown up after storms, from deep water. Annual. Summer and Autumn. Santon Sands, *Miss Hill*. Bantry Bay, *Miss Hutchins*. Torbay, *Mrs. Griffiths*. Belfast Bay, *Dr. Drummond*. Port Rush, *Mr. Moore*. Ilfracombe, and Mount's Bay, *Mr. Ralfs*. Jersey, *Miss White*.

GEOGR. DISTR. Shores of the British Islands.

DESCR. *Filaments* collected into widely spreading, blackish green, glossy strata, of several inches in diameter, which lie on the surface of flat rocks, or on the sands; at length rising to the surface and floating to the shore. In these strata the filaments are densely interwoven, and issue from the upper surface, and from the edges, in crisped bundles, one to two inches long. They are very tortuous, simple, or now and then cohering together, as if branched, and are of greater diameter than those of any other species of this genus, twice or thrice as thick as those of *L. muralis*. The endochrome is of dull, glaucous green; the annuli closely set; and the border of the tube broad and colourless. Sometimes the endochrome is interrupted at intervals, as if broken; and sometimes it separates as by a distinct articulation, into two portions, and it is probable that at a more advanced period the uppermost portion further separates from the lower, and becomes a new filament.

This is the largest growing, and strongest species of the genus, and in favourable situations becomes quite a handsome plant, resembling in all but colour, fine tufts of curling hair. But if we suppose it to have belonged to a sea nymph, the dark green hue is not so inappropriate.

Lyngbya majuscula was discovered by Miss Hill, early in the present century, and first described by Dillwyn, in his work on the British Confervæ. It is well known to British naturalists, and has been found in several localities on our shores; but on the Continent it appears to have escaped notice. Agardh quotes Dillwyn's figure under his *L. crispa*, a plant, which, to judge by a specimen communicated by Agardh himself to Sir Wm. J. Hooker, is a very different plant, having a verdigris-green colour, and being thrice as slender.

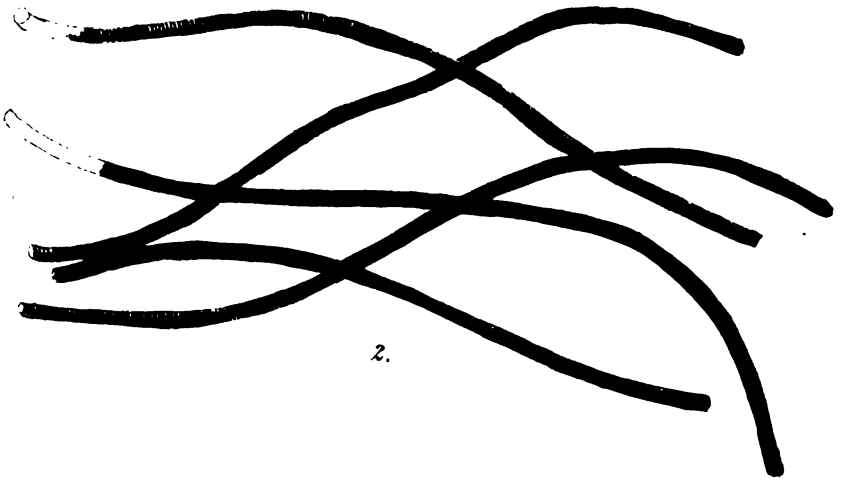
As a genus, *Lyngbya* is intermediate between *Oscillatoria* and *Calothrix*. From the first it differs, by having long, flexible filaments, destitute of oscillatory motion; and from the latter, by its stratified habit. There are several species, the most common of which is a terrestrial one (*L. muralis*), which forms a silky stratum of a brilliant green colour on the surface of damp ground, and abounds everywhere, and at all seasons. The major part of the species, are, however, marine; and, besides the present individual, three others are found on our coasts, and will be figured in a future number.

The genus *Bangia* has many points in common with *Lyngbya*, and is even united to it by Mr. Hassall, but if these genera are to be combined, *Bangia*, being the older name, must be adopted.

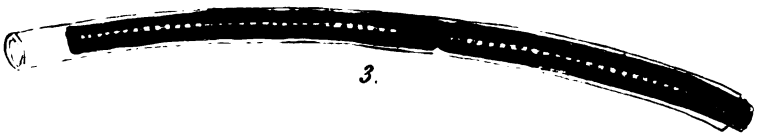
Fig. 1. LYNGBYA MAJUSCULA; Part of a stratum:—*natural size*. 2. Apices of two filaments:—*highly magnified*.



1.



2.



3.

PLATE CCCXI.

LYNGBYA FERRUGINEA, *Ag.*

GEN. CHAR. *Filaments* destitute of a mucous layer, free, flexible, elongated, decumbent, not oscillating. *Tube* continuous; endochrome green or purple, densely annulated, and finally separating into lenticular sporidia. LYNGBYA (*Ag.*),—in honour of *Hans Christian Lyngbye*, author of an excellent work on the Algæ of Denmark.

LYNGBYA *ferruginea*; filaments slender, flaccid, forming a long stratum of a verdegris-green colour, which gradually changes to a pale chestnut.

LYNGBYA *ferruginea*, *Ag. Syst. Alg.* p. 73. *Harv. in Hook. Brit. Fl.* vol. ii. p. 226. *Harv. Man.* ed. 2. p. 226.

LYNGBYA *æruginea*, *Ag. Syst.* p. 74. *Kg. Sp. Alg.* p. 282.

LYNGBYA *subsalsa*, *Carm. MSS.*

SCYTONEMA *effusum*, *Carm. MS. (ante).*

HAB. In small, mud-bottomed pools of brackish water, by the sea-side, filled at spring tides. *Appin, Capt. Carmichael.*

GEOGR. DISTR. Similar situations in the North of Europe.

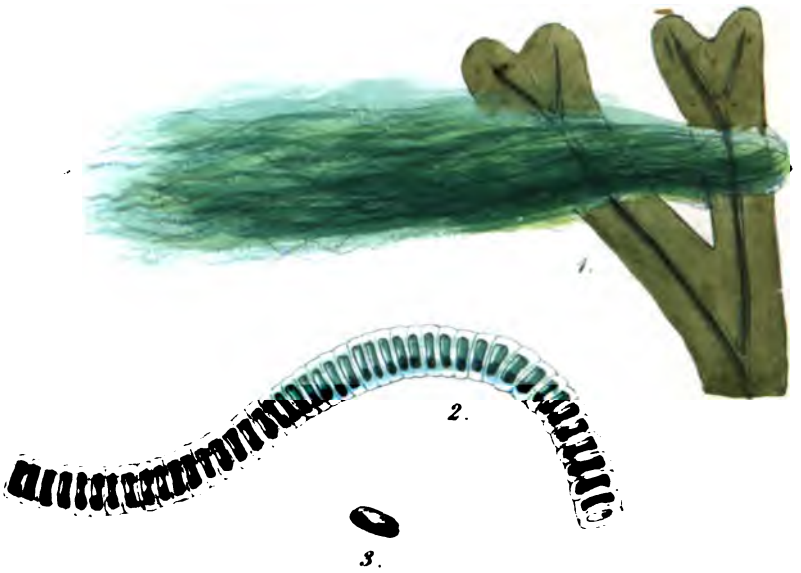
DESCR. *Stratum* "exceedingly thin and lax, extensive, at first of a vivid green colour, but passing gradually into a pale chestnut," *Carm.* *Filaments* an inch long, flaccid, bent in various curves, but not twisted, of a pale verdegris-colour under the microscope. *Endochrome* filling the tube, evidently striate, the striæ rather distant; border narrow. *Colour* of the mass when dry a dull verdegris-green without gloss.

No one appears to have noticed this plant but the late Captain Carmichael, a fact to be regarded more as a proof of the comparatively little attention which has yet been paid to the *Oscillatoricæ*, than evidence of the rarity of this particular species. How few of the collectors of seaweeds trouble themselves with the obscure vegetation of salt-water mud-bottomed pools near the shore:—yet such situations, when attentively examined, are found to be rich in microscopic forms, and in species of this curious family. I have no doubt

but that the present species, which appears to be not uncommon in Northern Europe, may yet be found in many other habitats than the one recorded above.

Fig. 1. *LYNGBYA FERRUGINEA*; a portion of the stratum, as it appears to the naked eye. 2. Filaments from the same:—*magnified*. 3. Portion of a filament, *highly magnified*.

A.



B.

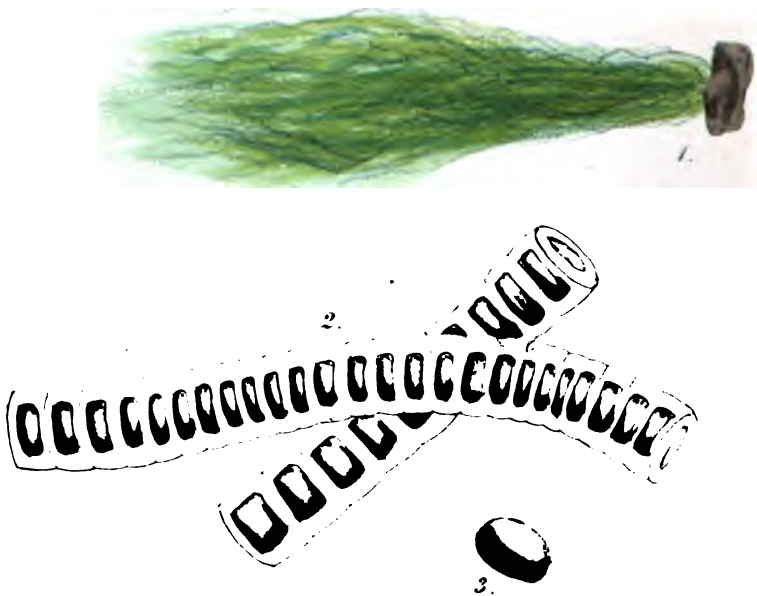


PLATE CLXXXVI. A.

LYNGBYA CARMICHAELII, *Harv.*

GEN. CHAR. *Filaments* destitute of a mucous layer, free, flexible, elongate, decumbent, not oscillating. *Tube* continuous; endochrome green or purple, densely annulated, and finally separating into lenticular *sporidia*. LYNGBYA (*Ag.*),—in honour of *Hans Christian Lyngbye*, author of an excellent work on the Algæ of Denmark.

LYNGBYA *Carmichaelii*; filaments very long, thickish, curled, and tortuous, cylindrical, forming extensive, grass-green, closely entangled strata; tube imperfectly jointed.

LYNGBYA *Carmichaelii*, *Harv. in Hook. Br. Fl.* vol. ii. p. 371. *Harv. Man.* p. 161. *Wyatt, Alg. Danm.* no. 230.

LYNGBYA *crispa*, *Carm. Alg. App. MS. (not of Ag.)*

HAB. On marine rocks, between tide marks; also on *Fuci*, *Zostera*, floating timber, &c. Annual. Summer. Appin, *Capt. Carmichael*. Plymouth and Torbay, *Mrs. Wyatt*. Cornwall, Swansea, Anglesea, &c., *Mr. Ralfs*. Jersey, *Miss White*. Several places on the Irish coast.

GEOGR. DISTR.

DESCR. Forming very widely spreading, closely interwoven strata, often many yards in diameter, spreading continuously over rocks, and investing any plant, or other object, which may obstruct its progress, covering them with a shaggy coat of an intense grass green. *Filaments* several inches long, floating freely in water, flaccid, at first straight, or but slightly curved, afterwards becoming very much curled and interwoven together. The colouring matter in an early stage nearly fills the tube, being divided into short portions, by closely approaching transverse striæ. As the season advances the endochrome gradually contracts, separating into distinct lenticular sporidia, a more or less perfect septum being visible between each. Finally, the sporidia burst through the tube, leaving it perfectly colourless. When dry, the filaments become a dull, dark green, without gloss: in this state they more or less adhere to paper.

One of the many discoveries of the late Capt. Carmichael of Appin, whose name it bears. The two species represented in this plate, while they are evidently closely allied to each other, differ in some degree from the true *Lyngbyæ*, approaching nearer to Agardh's genus *Sphæroplea*. There is a more distinct cellular division in the tube than is typical of the genus with which they are associated, and, perhaps, at a future time they may be removed. But the whole group requires revision, and deserves

more attention than it has yet obtained. The present species I believe to be common to many parts of the British coast; but is, perhaps, often confounded with *Conferva tortuosa*, which it much resembles in habit and general aspect.

A. Fig. 1. *LYNGBYA CARMICHAELII*, growing on *Fucus vesiculosus*:—of the natural size. 2. Portion of a ripe filament. 3. A sporidium:—both magnified.

PLATE CLXXXVI. B.

LYNGBYA SPECIOSA, *Carm.*

LYNGBYA speciosa; filaments long, thick, flaccid, straight, at length curled, the margin crenate, forming bright yellow-green strata, glossy when dry; tube imperfectly jointed.

LYNGBYA speciosa, *Carm. Alg. Appin. ined. Harv. in Hook. Br. Fl.* vol. ii. p. 371. *Harv. Man.* p. 161. *Wyatt, Alg. Danm.* no. 196.

HAB. On marine rocks, between tide-marks, and on *Fuci*. Annual. Summer. Appin, *Capt. Carmichael*. Paington, Torbay, *Mrs. Griffiths*. St. Michael's Mount, *Mr. Ralfs*.

GEOGR. DISTR.

DESCR. This species, like *L. Carmichaelii*, forms widely spreading strata of a vivid green colour, covering the surface of rocks and *Fuci* with a fleecy coat, till lifted by the returning tide. The diameter of the filament is nearly twice as great as in *L. Carmichaelii*, the colour is greatly brighter, and the substance more gelatinous and glossy. In other respects the plants closely resemble each other. Filaments at first straight, three or four inches long, flaccid, at length becoming curled and crenate. *Endochrome* at first nearly filling the tube, gradually contracting as it solidifies, and at length formed into a lenticular sporidium, which, when ripe, bursts through the walls of the tube, leaving the filaments perfectly colourless. A more or less evident division into cells is observable.

This very pretty species is nearly related to the preceding, from which it is chiefly distinguished by the larger size, brighter colour, and more lubricous substance. It adheres far more closely to paper in drying, and does not so perfectly recover its form after having once been dried.

B. Fig. 1. Tuft of *LYNGBYA SPECIOSA*, on a rock:—of the natural size. 2. Portion of mature filaments. 3. A sporidium:—all highly magnified.

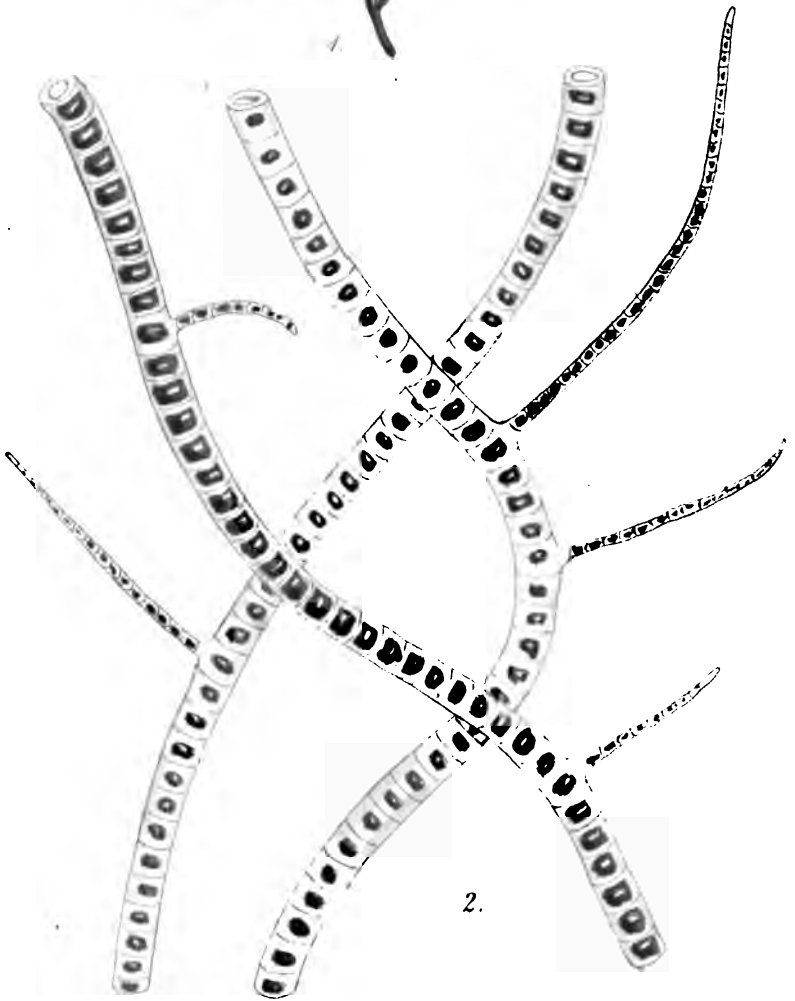


PLATE CCC.

LYNGBYA ? FLACCA, *Harv.*

GEN. CHAR. *Filaments* destitute of a mucous layer, free, flexible, elongated, decumbent, not oscillating. *Tube* continuous; endochrome green or purple, densely annulated and finally separating into lenticular sporidia. LYNGBYA (*Ag.*),—in honour of *Hans Christian Lyngbye*, author of an excellent work on the Algæ of Denmark.

LYNGBYA ? *flacca*; filaments short, tufted, straight or gently curved, simple, or having a few slender, proliferous, subulate, root-like ramuli, articulated; articulations shorter than their diameter, the endochrome at length contracting into a small central sporidium.

LYNGBYA ? *flacca*, *Harv. in Phyc. Brit. list*, vol. i. p. xv. *Harv. Man.* ed. 2. p. 227.

HORMIDIUM *flaccum*, *Kütz. Phyc. Gen.* p. 244.

HORMOTRICHUM *flaccum*, *Kütz. Sp. Alg.* p. 381.

CONFERVA *flacca*, *Dillw. t.* 49. *E. Bot. t.* 1943. *Harv. in Hook. Br. Fl.* vol. ii. p. 354. *Harv. Man.* ed. i. p. 131.

HAB. Parasitical on various small Algæ in tide-pools; on the *Fuci*, and growing also on floating timber. Annual. Summer. Not uncommon.

GEOGR. DISTR. Atlantic shores of Europe.

DESCR. *Filaments* from half an inch to an inch and a half in length, forming wide patches on floating timber, or covering various algæ with a silken beard, fixed at base, freely floating in the water; straight or gently curved, either quite simple or throwing out, here and there, a few slender, subulate, root-like processes, which seem to be a viviparous growth of the sporidium contained within the tube. *Articulations* rather well defined, shorter than their diameter, with a wide border; the endochrome at first filling the cell, but soon contracted, and then forming a small lenticular sporidium in the centre of the transparent articulation. *Colour* a beautiful grass-green. *Substance* lubricous and soft, closely adhering to paper in drying.

In the last edition of the Manual I have divided the genus *Lyngbya* into two sections, to the latter of which the species now described belongs, as well as *L. Carmichaelii* and *L. speciosa*, which have already been figured in this work. A better course would probably have been to have adopted Kützing's

genus *Hormotrichum* for this latter group, adding to it, as that author has done, *Conferva bangioides*, *C. Youngana*, and probably *C. collabens*, a species of which but little is yet known. In any future work I should probably bring these species together under one generic head, as they certainly have characters in common with each other, and such of them as have, like the present, been classed with the *Lyngbya* differ from the type of that genus in having a distinctly articulated filament.

I have frequently observed *C. flacca* put forth the root-like, proliferous branches given in our plate.

Fig. 1. Tufts of *LYNGBYA FLACCA* growing on *Hypnea purpurascens*:—*natural size*. 2. Portions of filaments from the same:—*highly magnified*.

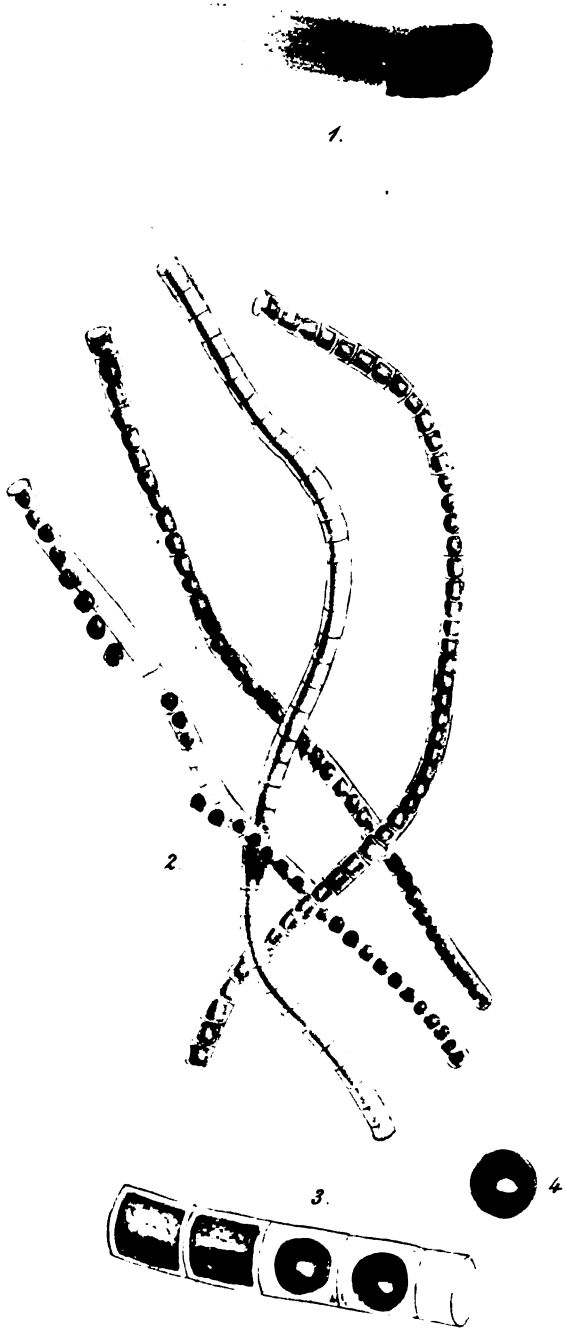


PLATE CCCXXXVI.

LYNGBYA (HORMOTRICHUM)

CUTLERIÆ, n. sp.

GEN. CHAR. *Filaments* destitute of a mucous layer, free, flexible, elongated, decumbent, not oscillating. *Tube* continuous; endochrome green or purple, densely annulated, and finally separating into lenticular sporidia. LYNGBYA (*Ag.*),—in honour of *H. C. Lyngbye*, author of an excellent work on the Algæ of Denmark.

LYNGBYA *Cutleria*; filaments excessively slender, soft, articulated; articulations about as long as broad, the endochrome at length formed into a spherical sporidium.

HAB. In æstuaries. Annual. Spring and summer. Near the mouth of the Otter, Budleigh Salterton, covered every tide, *Miss Cutler* (May 1850).

GEOGR. DISTR.

DESCR. *Filaments* forming continuous tufts, excessively slender and delicate (like those of *Conferva bombycina*), soft, curved, but not twisted, articulated throughout. In an early stage the filament is confervoid, the cells, which are about as long as, or a little longer than broad, being filled with a pale green fluid endochrome. At a later period this gradually becomes granular and contracts, no longer filling the tube, and finally it is consolidated into a brilliant bead-like green sporidium. Soon afterwards, the membrane bursts, the filaments break up, and the mature fruit is dispersed in the water. *Substance* somewhat gelatinous, the plant adhering most closely to paper in drying.

I am indebted to Miss Cutler, of Budleigh Salterton, for a specimen of the pretty little plant here figured. It has all the generic characters of Kützing's genus *Hormotrichum*, which has been already placed provisionally as a subgenus of *Lyngbya*, but it does not appear to accord specifically with any of the species described by Kützing. Believing myself, therefore, at liberty to assign a specific name to it, I wish to dedicate our new species to its discoverer, who has greatly enriched the British marine

flora with discoveries and observations, and to whom Dr. Greville has already inscribed the genus *Cutleria*.

Fig. 1. LYNGBYA (HORMOTRICHUM) CUTLERIA:—*the natural size*. 2. Portions of filaments of various ages:—*magnified*. 3. A small portion of a partly mature filament; and 4, a sporidium:—*both very highly magnified*.

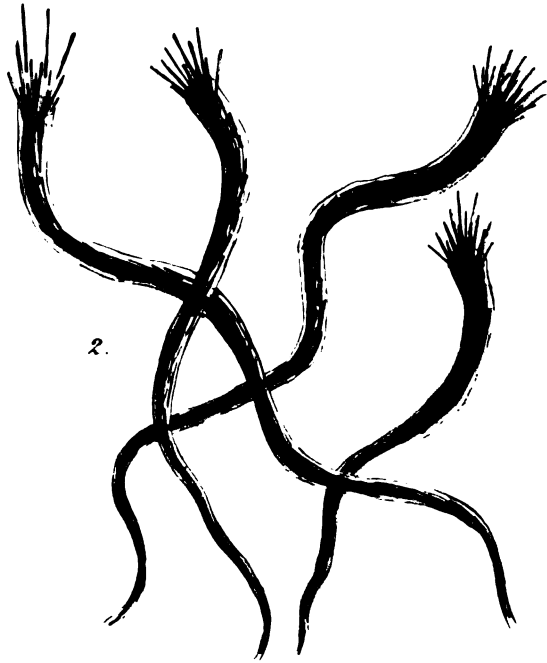


PLATE CCXLIX.

MICROCOLEUS ANGUIFORMIS, *Harv.*

GEN. CHAR. *Filaments* minute, rigid, straight, transversely striate, bundled, and enclosed within membranaceous, simple or branching sheaths, from whose apices they oscillate. MICROCOLEUS (*Desmaz.*),— from *μικρος*, *small*, and *κολεος*, a *sheath*.

MICROCOLEUS *anguiformis*; sheaths snake-like, simple, decumbent, tapering much to the extremity; filaments slender, with distant striæ.

MICROCOLEUS *anguiformis*, *Harv. MSS. Hass. Fr. Water Alg.* p. 261. t. 70. fig. 1.

HAB. Pools of brackish water, near the shore, at Dolgelly, *Mr. Ralfs*.

GEOG. DISTE. Coast of Wales.

DESCR. This minute plant forms a dense stratum of a dark green colour on the surface of the mud. The sheaths are grouped together without order, decumbent, much entangled, and variously twisted into many snake-like folds, broad at the extremity from which the filaments oscillate, and tapering much towards the other end. The inclosed filaments are short, slender, and straight, with distant striæ. The colour is a dull blackish green, without gloss when dry.

A minute but curious Alga, allied in many points to *Oscillatoria*, from which genus *Microcoleus* chiefly differs in possessing frond-like sheaths, containing threads bundled together. At first these sheaths appear scarcely more compound than a single filament, but as the plant advances, the sheath widens and is found full of a multitude of filaments. These oscillate, like those of an *Oscillatoria*, either from the wide mouth of the sheath, or from any accidental rupture which may happen in its side.

I am indebted to Mr. Ralfs for the only specimens I have seen of this plant, and am not aware of any habitat for it, save the one above recorded. It ought to occur in similar places, on

other parts of the coast, but unless closely looked after may easily escape detection.

Fig. 1. Portion of the stratum :—*natural size*. 2. Sheaths, or fronds. 3. Apex of a sheath, with protruding filaments :—*both magnified*.

A



B



C



PLATE CV. A.

OSCILLATORIA LITTORALIS, *Carm.*

GEN. CHAR. *Filaments* lying in a mucous matrix, rigid, simple, acicular, vividly oscillating. *Tube* continuous; endochrome green, densely annulated with close, parallel, transverse striæ.—OSCILLATORIA, (*Vauch.*), from the motion observed in the filaments, which resembles the *oscillations* of a pendulum.

OSCILLATORIA *littoralis*, *Carm.* Stratum of a vividly æruginous green colour; filaments thick, dark green, variously curved; striæ conspicuous, close-set.

OSCILLATORIA *littoralis*, *Carm. Alg. Appin. ined. Harv. in Hook. Brit. Fl.* vol. ii. p. 375. *Harv. Man.* p. 165.

HAB. In pools, along the muddy sea shore, flooded by Spring tides. Appin, *Capt. Carmichael*.

DESCR. *Stratum* exceedingly thin, slimy, bullated by the extrication of air bubbles, of a dark green colour, spreading to an indefinite extent over the muddy bottom of the pool. *Filaments* 1–2 lines long, much thicker than those of *O. nigra*, straight or slightly curved, radiating very irregularly, and generally in twisted bundles. *Striæ* strongly marked, at intervals of about one third the diameter of the filament". *Carm. l. c.*

Of this I have only seen *Capt. Carmichael's* specimens, from one of which the figure is taken. I find the filaments curved and twining together; the striæ very dense, and the mass of endochrome divided at uncertain intervals into portions, which probably break off eventually and become new filaments.

A. Fig. 1. OSCILLATORIA LITTORALIS, part of a stratum:—of the natural size.
2. Filaments:—highly magnified.

PLATE CV. B.

OSCILLATORIA SPIRALIS, *Carm.*

OSCILLATORIA *spiralis*; stratum membranaceous, or coriaceous, æruginous or blackish-green; without much lubricity; filaments slender, spirally twisted, densely interwoven, radiating in all directions.

OSCILLATORIA *spiralis*, *Carm. Alg. Appin. ined. Harv. in Hook. Br. Fl.* vol. 2. p. 377. *Harv. Man.* p. 167.

OSCILLATORIA *subsalsa*, *Harv. l. c.* p. 376. *Harv. Man.* p. 165.

SPIRILLUM *rupestre*, *Hass. Freshw. Alg.* p. 277. t. 75. f. 6.

HAB. On rocks by the sea-side, above and between tide marks, by At Appin by rocks where birds are in the habit of resting, *Capt. Carmichael*.

Brighton, on a plank between high and low water mark, *Mr. Borrer*;
Rocks by the Sea, Penzance, *Mr. Ralfs*.

GEORG. DISTR. Coast of France.

DESCR. *Stratum* of indefinite extent, firm, membranaceous or coriaceous, peeling off in large flakes, without much lubricity, and without gloss when dry, of a dark green when growing above high-water mark, and a blueish green when submerged. *Filaments* slender, densely interwoven together, twisted like the letter S, or like a corkscrew, radiating in all directions.

The specimens from the South of England are of a much brighter colour, and the stratum thinner than in the original Scotch specimens, but the microscopic character is very similar. Whether the *O. subsalsa* of Agardh be different, I am unable to say.

B. Fig. 1. OSCILLATORIA SPIRALIS; part of a stratum:—of the natural size.
2. Filaments:—highly magnified.

PLATE CV. C.

SPIRULINA TENUISSIMA, *Kütz.*

GEN. CHAR. *Filaments* lying in a mucous layer, rigid, simple, spirally twisted, vividly oscillating. *Tube* continuous; endochrome green, more or less distinctly annulated.—SPIRULINA (*Turp.*). a diminutive of *spira*, a twist or curl.

SPIRULINA tenuissima; "stratum very lubricous, æruginous, subradiant; filaments densely spiral, very slender, parallel, flexuous".

SPIRULINA tenuissima, *Kütz. Phyc. Gen.* p. 183. *Ralfs*, in *Ann. Nat. Hist.* vol. xvi. p. 309. Pl. 10.

HAB. On decaying *Alga* in a brackish pool near the Menai Bridge, and on sticks in brackish pools at Penman Pool near Dolgelly, *Mr. Ralfs*.
Aberdeen, *Dr. Dickie*.

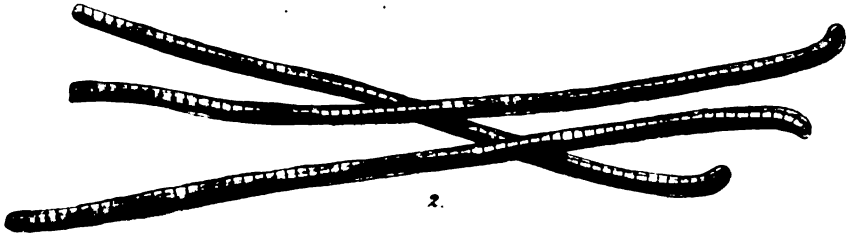
GEORG. DISTR. Europe.

DESCR. "It forms at first a thin pellicle of a rich green colour, but in an advanced state becomes somewhat skin-like and tinged with brown; the filaments are extremely slender, of a pale blueish green colour, elongated, straight when free, equal, not attenuated at the extremities, vividly oscillating. *Spines* very close, like the volutions of some shells, broader than long. There is no appearance of granular matter, and the filaments are so fine that I cannot ascertain whether they are jointed". *Ralfs. l. c.*

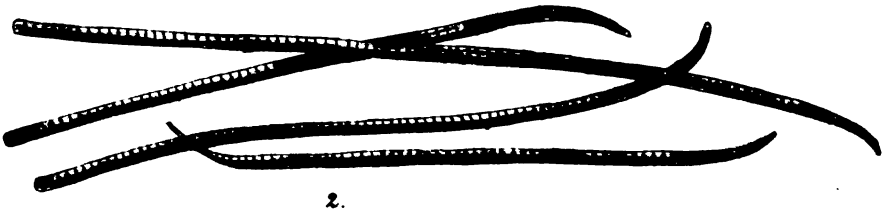
Having never seen this plant in a living state, I prefer giving *Mr. Ralfs'* excellent description in his own words. I am indebted to *Dr. Dickie* for beautiful dried specimens, from one of which my figure has been taken.

C. Fig. 1. SPIRULINA TENUISSIMA, part of the stratum:—of the natural size.
2. Filaments, :—highly magnified.

A.



B.



C.

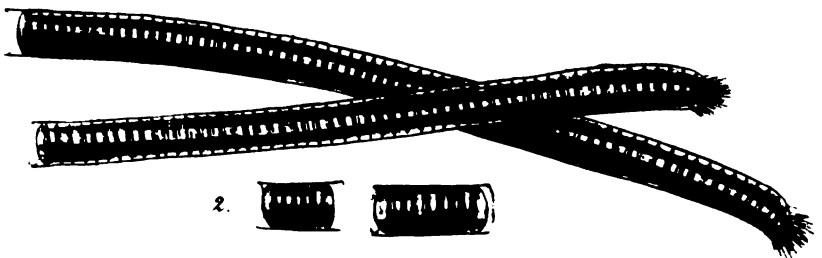


PLATE CCLI. A.

OSCILLATORIA NIGRO-VIRIDIS, *Thw. n. s.*

GEN. CHAR. *Filaments* lying in a mucous matrix, rigid, simple, vividly oscillating. *Tube* continuous. *Endochrome* annulated with more or less close, parallel, transverse striæ. *Oscillatoria* (Vaucher),—from the motion observed in the filaments.

OSCILLATORIA *nigro-viridis*; *stratum* of a very dark olive-green colour; *filaments* delicate, pale green, rigid, with obtuse, curved apices; *striæ* inconspicuous, distant about half a diameter of the filament; *endochrome* very slightly granulose.

HAB. In a brackish ditch at Shirehampton near Bristol. Aug. 1847, G. H. K. Thwaites.

DESCR. *Stratum* thin, of a dark olive green, almost black colour, growing upon the mud and subsequently floating in large masses. *Filaments* of a pale dull green colour, with obtuse, distinctly curved, scarcely attenuated apices. *Striæ* not conspicuous, distant from each other about half a diameter of the filament. *Endochrome* scarcely granulose.

This species, which I have met with only once, bears some resemblance, as has been remarked to me by the Rev. M. J. Berkeley, to *Oscillaria uacinata*, of Kützling, but the latter is a smaller species than ours, and has the striæ of its filaments more distinctly marked. *Thw.*

PLATE CCLI. B.

OSCILLATORIA *subuliformis*; *stratum* of an intense æruginous green colour; *filaments* bright green, subuliform; *striæ* inconspicuous, distant from one half to three quarters of a diameter of the filament; *endochrome* not evidently granulose.

HAB. In brackish ditches, at Shirehampton near Bristol, during the Summer and Autumn, not uncommon. G. H. K. Thwaites.

DESCR. *Stratum* thin, growing upon the mud, subsequently floating, appearing black in the water, but when taken out, of a beautiful deep blue-green colour. *Filaments* very delicate, bright green, gradually attenuated towards the apices, which are subacute and much curved. *Striæ* inconspicuous, distant from each other about three-fourths of a diameter of the filament. *Endochrome* uniform, not visibly granulose.

This beautiful species, the filaments of which oscillate very vividly, is an extremely interesting object under the microscope. The curved ends of the filaments may then be seen to move in a spiral direction, showing that this is the real motion of the filaments, though they may appear to an inattentive observer to have merely a waving lateral movement. Without the sanction and kind assistance of Mr. Berkeley, I should scarcely have ventured to describe this and the foregoing species as new, but he has kindly compared them with authentic specimens in his own herbarium, and considers them hitherto undescribed. *Thw.*

PLATE CCLI. C.

OSCILLATORIA insignis; *stratum* of a dark brown, almost black colour; *filaments* brown, of considerable diameter, their apices obtuse, slightly oblique, and ciliated. *Striæ* conspicuous, very close; *endochrome* distinctly granulose.

HAB. In a brackish ditch at Shirehampton near Bristol, in Nov. 1848. *G. H. K. Thwaites.*

DESCR. *Stratum* thin, covering decaying vegetable matter at the bottom of the ditch in which it occurred, with a dark brown coating, becoming somewhat greenish in drying. *Filaments* very large, rather brittle; their apices rounded, somewhat oblique and furnished with numerous delicate motionless cilia. *Endochrome* distinctly granulose; the granules being principally evident close to the *striæ*, which they render more conspicuous.

The cilia which terminate the filaments of this fine species, are not peculiar to it alone. Professor Kützing has figured in his "Phycologia Generalis" similar appendages to the filaments of *Oscillaria subfusca*, and has noted their occurrence in another species. Careful observation shews that these cilia have no proper motion of their own, and therefore can exercise no agency on the movements of the filaments; they appear to be mere appendages, or terminations of the membranous tube, and to perform no important function in the economy of the plant. *Thw.*

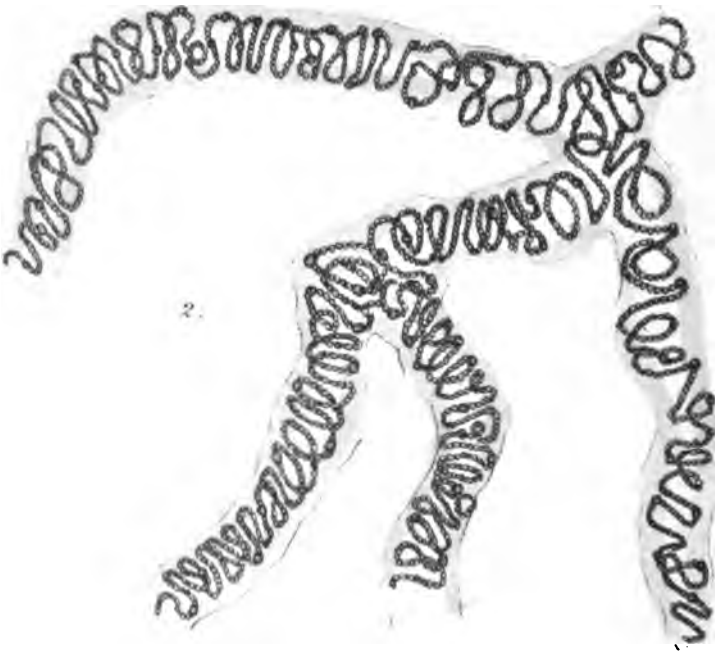


PLATE CCLVI.

MONORMIA INTRICATA, Berk.

GEN. CHAR. *Fronde* gelatinous, branched; the branches containing a spiral moniliform filament, composed of spherical, coloured cells, interrupted here and there by a cell of a different kind, and of larger size. *Spores* formed from the ordinary cells. MONORMIA (Berk.),—from *μνος*, one, and *οπος*, a necklace.

MONORMIA intricata.

MONORMIA intricata, Berk. *Gl. Brit. Alg.* p. 46. t. 18. *Harv. Man.* ed. 1. p. 185. *Hass. Brit. Fresh Water Algæ*, p. 285. pl. 75. f. 11.

HAB. At Gravesend, in the ditches of the marsh to the south of the Frindsbury canal, in great abundance, in June, 1832, *Rev. M. J. Berkeley*. Ditch (brackish) near Lighthouse, Shirehampton, Bristol, *Mr. G. H. K. Thwaites*.

GEOGR. DISTR. Not noticed out of England?

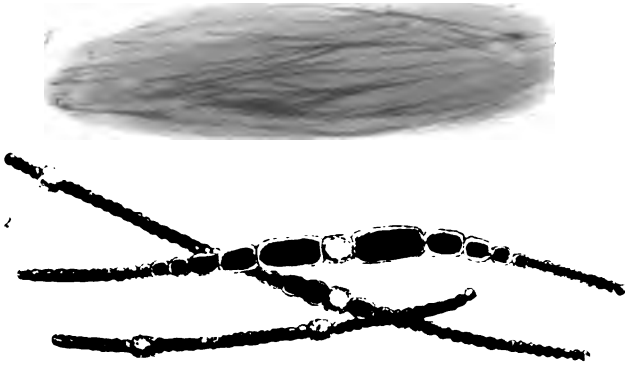
DESCR. "Forming small, roundish, gelatinous masses floating amongst different species of *Lemna* in fresh water, but probably within the influence of the tide; and also amongst *Enteromorpha intestinalis*, and even within its frond, in brackish water. The plant is at first of an olive yellow, gradually assuming a greener tint, and when dried, of a deep verdigris. Very gelatinous, delicately branched; the branches very flaccid. Under a high magnifier the whole plant is evidently composed of gelatine, in the centre of which runs a single moniliform filament following the ramifications, and in its progress curling to and fro repeatedly across the thread; the joints being nearly globular. The specimens from the interior of *Enteromorpha intestinalis* are paler, and have often longer joints amongst the globular ones."—Berk. In young specimens the moniliform thread is found composed of a string of spherical, olive-green cells, of equal size, here and there interrupted by a larger, subquadrate cell, much paler than the rest. As it advances in age the cells, nearest the quadrate cell enlarge, become ellipsoid, and filled with a dense endochrome; in fact, converted into spores. The process of change into spores goes on at each side of the quadrate cell (which remains unchanged), until the whole of the filament is turned into a string of spores. If these simply organized plants have sexes, the functions of the male probably reside in these quadrate cells.

This curious plant has but a slender claim for admission into this work, being commonly a fresh-water production; but the specimens here figured having been obtained from the same salt-water ditches which have already supplied us—through the kindness of Mr. Thwaites,—with several interesting subjects, I have thought that there could be no objection to giving a figure of a

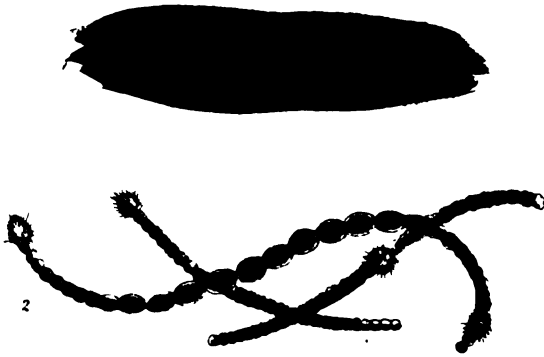
plant interesting by its structure and beauty, and so closely allied to the *Sphærozygæ*, which have already appeared. *Monormia* seems to differ from *Sphærozyga* chiefly in possessing a gelatinous branching matrix, so loose in structure that it can hardly be called a frond, surrounding the spirally-twisted filament. This filament is of indefinite length, having many connecting cells: the filaments of the *Sphærozygæ*, on the contrary, are generally short, with seldom more than one or two connecting cells. The fructification in both appears formed on the same type.

Fig. 1. Stratum of *MONORMIA INTRICATA* as it appears to the eye. 2. Part of a branching frond:—*magnified*. 3. Portion of the filament from the same:—*very highly magnified*.

A



B



C

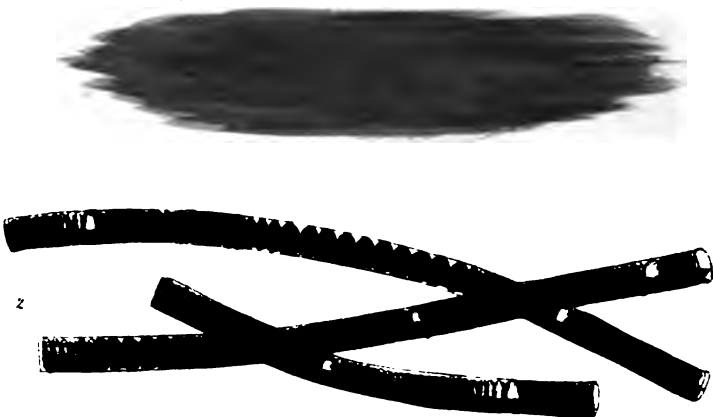


PLATE CXIII. A.

SPHÆROZYGA CARMICHAELII, *Harv.*

GEN. CHAR. "*Filaments* free, simple, moniliform, consisting of a series of ordinary cells interrupted here and there by a cell of a different kind (*connecting-cell*), which is generally of a larger size, and often ciliated." *Thw.* Spores formed from the ordinary cells. SPHÆROZYGA (*Ag.*),—σφαῖρα, a *sphere*, and ζυγος, a *yoke*. The name *Anabaina*, applied to this genus by Bory, is pre-occupied for a genus of *Euphorbiaceæ*, by A. de Jussieu.

SPHÆROZYGA *Carmichaelii*; "spores large, oblong, twice or thrice as long as broad, commencing to be formed from the cells nearest the connecting one." *Thw. in litt.*

BELONIA *torulosa*, *Carm. Alg. Appin. ined. Harv. in Hook. Br. Fl. vol. ii. p. 379. Harv. Man. p. 167.*

ANABAINA *marina*, *Breb. in An. Sc. Nat.*

HAB. On decaying heaps of marine Algæ, also in ditches of brackish water. *Appin, Capt. Carmichael.* Near the Menai bridge; also at Barmouth, and Penman Pool, near Dolgelly, *Mr. Ralfs.* Shorehampton, near Bristol, *Mr. G. H. K. Thwaites.*

GEOGR. DISTR. Probably throughout Europe.

DESCR. "In the beginning of autumn, vast quantities of filamentous Algæ are detached from their places of growth, and deposited here and there along the shore in extensive fleeces. When these fleeces begin to decay, this plant makes its appearance in the form of a very thin gelatinous pellicle, of a vivid green colour, spreading over the surface of the decaying mass. The pellicle is made up of straight" (or slightly curved), "brittle, moniliform filaments, one fourth of a line in length, and tapering at both ends." *Carm.* Spores of considerable size, remaining green, or assuming a brownish colour, when mature.

I have compared specimens of *Anabaina marina*, *Breb.*, received from Messrs. Ralfs and Thwaites, with Carmichael's original *Belonia torulosa*; and find them to agree in every essential particular. This plant is unquestionably a *Sphærozyga*, to all the individuals of which genus the specific name "*torulosa*," which has the priority, is equally applicable. I have therefore dedicated this curious and beautiful parasite to the memory of its first discoverer, whose patient investigation of Cryptogamic plants has added so much to our knowledge of the more minute kinds.

A. Fig. 1. SPHÆROZYGA CARMICHAELII; appearance of the mass. 2. Filaments:—*magnified.*

PLATE CXIII. B.

SPHÆROZYGA THWAITESII, *Harv. (n. sp.)*

SPHÆROZYGA *Thwaitesii*; "spores elliptical, once and a half as long as broad, commencing to be formed from the cells most distant from the ciliated (*connecting*) one." *Thw. in litt.*

ANABAINA Thwaitesii, Harv. MS.

HAB. On the muddy sides of ditches of brackish water, also floating. Dolgelly, Mr. Ralfs. Shorehampton, near Bristol, Mr. G. H. K. Thwaites. Porbury, Somerset, Mr. Broome.

GEogr. DISTR. Probably in similar situations throughout Europe.

DESCR. "Very gelatinous, deep green, sometimes almost black. *Filaments* pale green, curved, entangled; *connecting cells* large, ciliated, subspherical, slightly oblong, of a lighter colour than the ordinary cells, which are somewhat compressed. *Spores* of a deep brown, when mature." *Thw. in litt.*

My first acquaintance with this little plant was from a beautifully mounted specimen, communicated by G. H. K. Thwaites, Esq., of Bristol, to whom I am indebted for valuable notes and sketches of the three species now figured, without which assistance I should scarcely have ventured to publish them. I wish it therefore to bear the name of this gentleman, though I have since learned that it was originally detected by Mr. Ralfs, who has also, with his usual kindness, favoured me with notes and remarks. Mr. Thwaites observes that the *connecting cell*, which in this species is ciliated, is generally placed at or near the end of the filament, a peculiarity also noticed in *Anabaina velutina*, Breb., and in some others of this genus.

B. Fig. 1. SPHÆROZYGA THWAITESII; appearance of the mass. 2. Filaments: magnified.

PLATE CXIII. C.

SPERMOSIRA LITOREA, Kütz.

GEN. CHAR. "*Filaments* slightly mucous, free, simple, cylindrical, enclosed in a very delicate, membranous tube. *Cells* lenticular; *connecting cells* larger, compressed." *Thw. Spores* formed from the ordinary cells. SPERMOSIRA (Kütz.),—from σπέρμα, a seed, and σπῆρα, a chain.

SPERMOSIRA litorea, Kütz. Phyc. Gen. p. 213.

HAB. In muddy brackish ditches, with the preceding. Barmouth, Rev. T. Salway. Dolgelly, &c., Mr. Ralfs. Shorehampton, Mr. G. H. K. Thwaites.

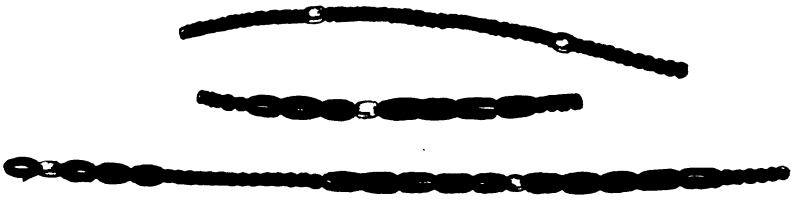
GEogr. DISTR. Probably throughout Europe, in similar situations.

DESCR. "Scarcely gelatinous, forming a deep green fleecy covering to floating plants, on which it occurs. *Filaments* of considerable diameter, nearly straight. Ordinary cells of a beautifully blue-green colour, very short and compressed, giving the filaments the appearance of an *Oscillatoria*; *connecting cells* of a pale reddish, but sometimes the plant is of an uniform dull green." *Thw. in litt.* *Spores* elliptical, at length acquiring a deep brown colour.

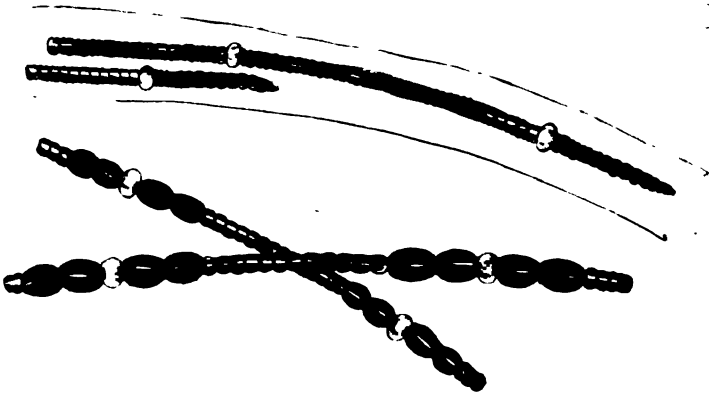
It will be seen by the figure, that the presence of a membranous tube to the filament, alone distinguishes this genus from *Sphærozyga*.

C. Fig. 1. SPERMOSIRA LITOREA; appearance of the mass. 2. Filaments:—magnified.

A.



B.



C.

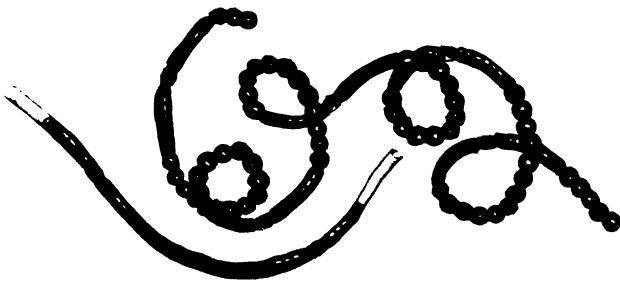


PLATE CLXXIII. A.

SPHÆROZYGA BROOMEI, *Thw. MSS.*

GEN. CHAR. *Filaments* free, simple, moniliform, consisting of a series of ordinary cells, interrupted here and there by a cell of a different kind (*connecting cell* or *heterocyst*). *Spores* formed from the ordinary cells. SPHÆROZYGA (*Ag.*),—from *σφαῖρα*, a *sphere*, and *ζυγος*, a *yoke*.

SPHÆROZYGA *Broomei*; “spores numerous, elliptical, twice as long as wide, not much exceeding in width the ordinary cells, commencing to be formed from the cells nearest the connecting cells: connecting cells smooth, subquadrate, rather longer than wide.”—*Thw. MSS.*

HAB. On dead leaves of *Myriophyllum*, &c., in a brackish ditch at Shirehampton, near Bristol. June. *Mr. G. E. Broome*; *Mr. G. H. K. Thwaites*.

“A very distinct species, first detected by G. E. Broome, Esq., an excellent Cryptogamic botanist, after whom it is named.”—*Thwaites*.

Fig. A. Filaments of SPHÆROZYGA BROOMEI:—*magnified 250 linear.*

PLATE CLXXIII. B.

SPHÆROZYGA BERKELEYANA, *Thw. MSS.*

SPHÆROZYGA *Berkeleyana*; “Spores large, twice the width of the ordinary cells, oblong, half as long again as wide, becoming brown when mature, generally two on each side the connecting cell, which is spheroidal, slightly compressed. Young filaments included, one or several together, in a defined, mucous sheath.”—*Thw. MSS.*

HAB. Scattered amongst the filaments of *Conferva fracta*, &c., in a brackish ditch at Shirehampton, near Bristol. June. *Mr. G. H. K. Thwaites*.

“This fine species, which is named in honour of Rev. M. J. Berkeley, is interesting from the circumstance of its filaments, when young, being enclosed, often several together, in definite, gelatinous sheaths, out of which they appear to escape before the spores are mature. There are other species, occurring in fresh

water, which exhibit the same peculiarity of structure, but it does not seem to have hitherto been noticed.”—*Thw. MS.*

Fig. 1. SPHEROZYGA BERKELEYANA ; filaments :—*magnified 250 linear.*

PLATE CLXXIII. C.

SPERMOSIRA HARVEYANA, *Thw. MS.*

GEN. CHAR. “Same as that of *Sphærozyga*, except that each filament is enclosed in a very delicate, membranous sheath.”—*Thw.*

SPERMOSIRA *Harveyana* ; “filaments much curved, composed of cells nearly as long as broad : spores exactly spherical, almost twice the diameter of the cells : connecting cells subquadrate, rather longer than wide, and of the same width as the ordinary cells.”—*Thw.*

HAB. Occurring intermixed with *Sphærozyga Broomei*, at Shirehampton, near Bristol. June, 1847. *Mr. G. H. K. Thwaites.*

“This beautiful species differs from the *Spermosira litorea*, Kütz., figured in [our] Plate CXIII., in its spores being not at all compressed, and its ordinary cells much longer compared with their width. The membranous sheath investing the filament is with difficulty seen, and the plant bears considerable resemblance to some species of *Sphærozyga*. The curved filaments and spherical spores render it not very unlike *Monormia intricata*, Berk., from which it is, however, perfectly distinct”—*Thw. MS.**

Fig. 1. C. SPERMOSIRA HARVEYANA :—*magnified 250 linear.*

* I am indebted to my friend G. H. K. Thwaites, Esq., of Bristol, for the drawings copied in Plate CLXXIII., and the accompanying descriptive characters. I have also to return him my thanks for the honour he has done me in naming the *Spermosira* ; but especially for the hearty expressions which accompanied the “*patent.*” Writing to congratulate me on a recent appointment, after the kindest expressions, he concludes by saying, “Do let me, in honour of the occasion, call the beautiful new *Spermosira*, of which I have just sent you a sketch, *S. Harveyana*, and thus pay the first tribute of respect, of this kind, to you in your new capacity.”

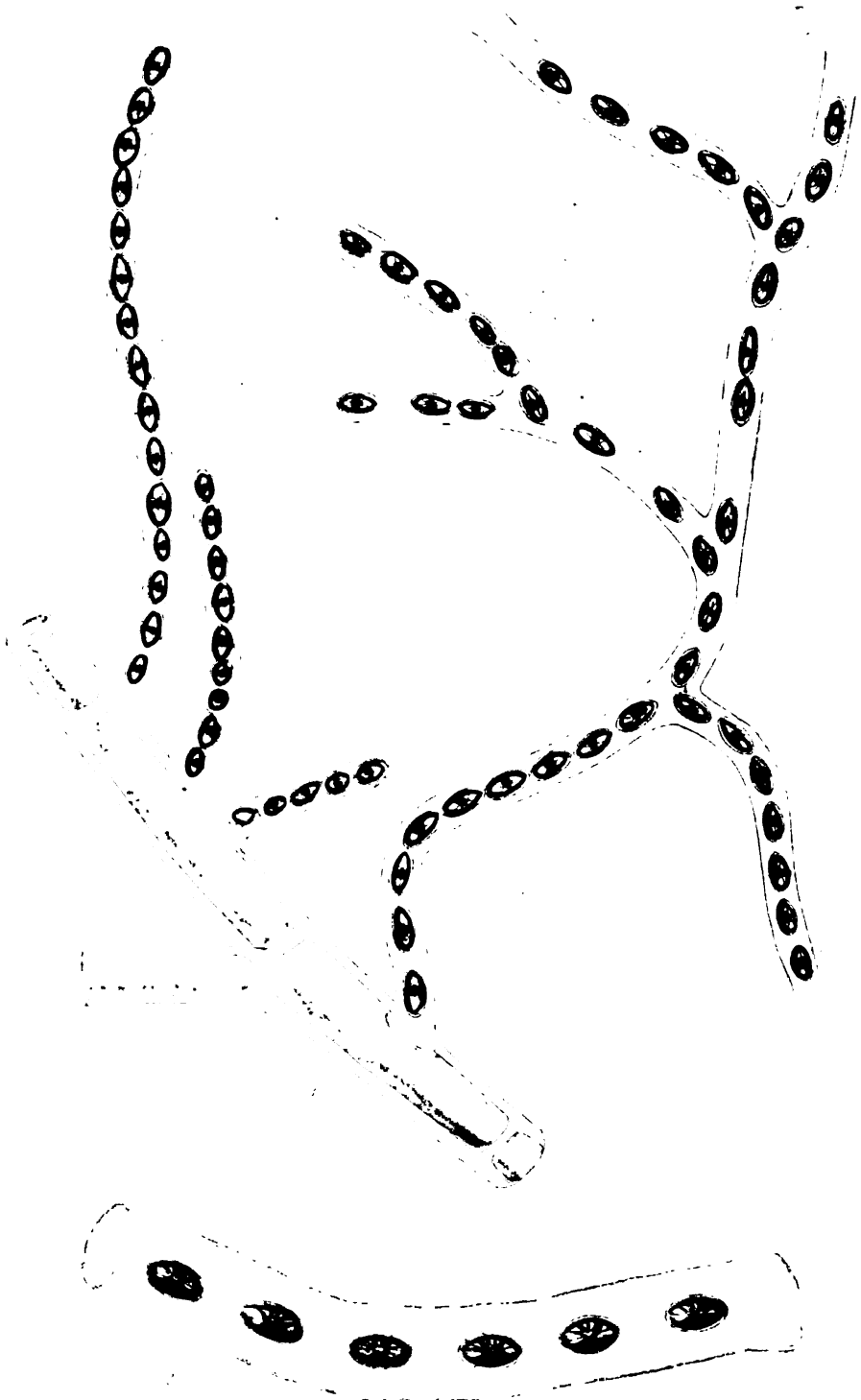


PLATE CCXIII.

HORMOSPORA RAMOSA, *Thw.*

GEN. CHAR. *Filaments* gelatinous, confervoid, each enclosing a linear series of oval or spherical cells. *Endochrome* green. *Fructification* : cells of the filaments enlarged and become converted into spores.

HORMOSPORA (*Brébisson*),—from *ὄσπος*, a *necklace*, and *σπόρα*, a *seed*.

HORMOSPORA *ramosa* ; filaments branched ; endochrome radiated.

HAB. Growing attached to the filaments of *Cladophora fracta* in a salt-water lake near Wareham, Dorsetshire. August and September. *Rev. W. Smith.*

DESCR. *Filaments* gelatinous, irregularly branched. *Cells* at first subcylindrical and closely coherent ; subsequently becoming ovate and distinct. *Endochrome* pale green, radiating from a central nucleus. Filaments at length resolved into separate spores, each of which is surrounded by a considerable amount of gelatine.

This pretty species bears a considerable resemblance to *Hormospora mutabilis*, Brébisson ; it differs, however, in its filaments being branched instead of being simple as in that species. In *H. mutabilis* the young cells are described as being subspherical, and the endochrome is stated to be lamellose ; whereas in the present species the endochrome is radiated, and the immature cells are nearly cylindrical. *H. mutabilis* occurs in fresh-water ponds ; whilst this inhabits a salt-water lake, to which the sea has access occasionally.

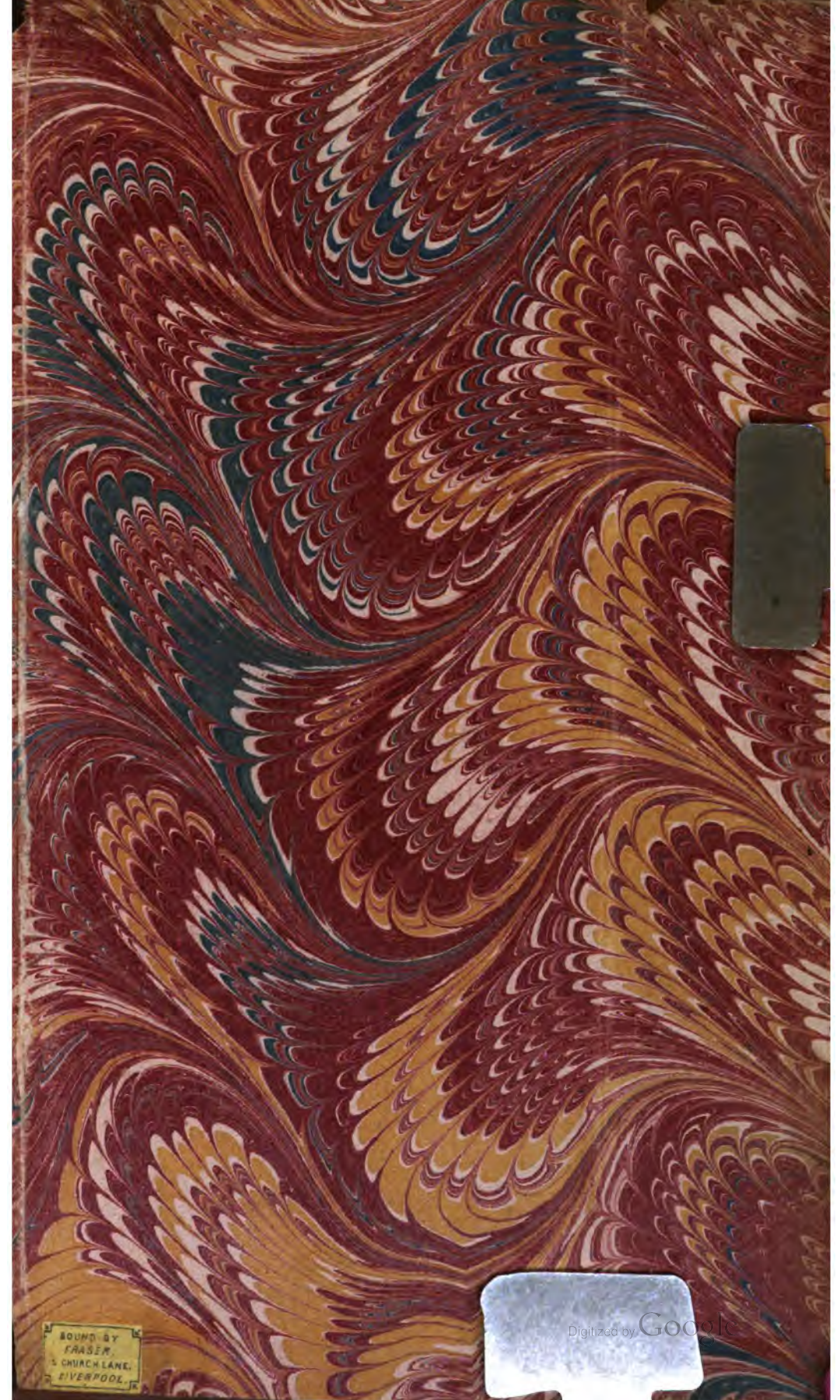
The filaments of *H. ramosa* when young are not unlike those of a *Sphaeroplea*, between which genus and the *Palmelleæ*, *Hormospora* would seem to form a connecting link.

[I am indebted to my friend G. H. K. Thwaites, Esq., of Bristol, for the drawing and description here given. The genus *Hormospora* was first proposed by M. Brébisson in the year 1840, and a further account accompanied by figures of two species, both natives of stagnant fresh water, has been given by that accomplished naturalist, in the *Annales des Sciences Naturelles* for January, 1844. The species now described is the first yet

noticed in salt water. Though not actually a *marine* plant, it has as much claim to a place in this work as some others already introduced, and I have pleasure in introducing the genus to British botanists. I should mention that the *Hormospora mutabilis*, stated to have been found by Mr. M^c Ivor, proves on a more careful examination to be an animal substance.—*W.H.H.*]

Fig. 1. Young and mature filaments of *HORMOSPORA RAMOSA*, growing upon *Cladophora fracta*. 2. Cells become converted into spores:—*all highly magnified (about 300 linear.)*





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